CBCS SCHEME

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17EE32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the expression for Delta-star transformation. **(06 Marks)**

b. Using source transformation, find the power delivered by 50V source shown in Fig.Q.1(b). **(06 Marks)**

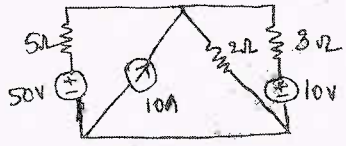

Fig.Q.1(b)

c. Find the voltage a/c 20Ω resistor in the network shown in Fig.Q.1(c). **(08 Marks)**

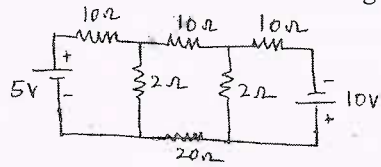

Fig.Q.1(c)

OR

2 a. Determine the equivalent resistance between the terminals AB for the network shown in Fig.Q.2(a). **(06 Marks)**

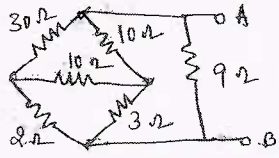

Fig.Q.2(a)

b. Find the node voltages V_1, V_2 and V_3 in the circuit shown in Fig.Q.2(b) using nodal analysis. **(08 Marks)**

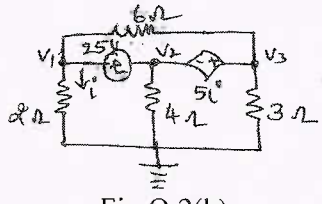

Fig.Q.2(b)

c. Draw the dual of the network shown in Fig.Q.2(c). **(06 Marks)**

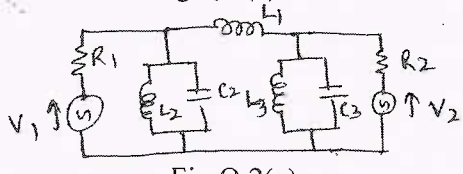

Fig.Q.2(c)

Module-2

3 a. State and explain superposition theorem. **(06 Marks)**

b. For the circuit shown in Fig.Q.3(b) obtain Thevinins equivalent circuit as seen from terminals p-q. **(08 Marks)**

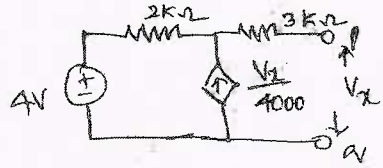

Fig.Q.3(b)

c. Find the voltage 'V_x' and apply reciprocity theorem to the networks shown in Fig.Q.3(c). **(06 Marks)**

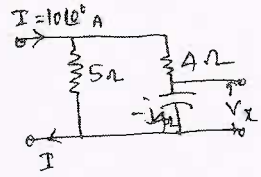

Fig.Q.3(c)

OR

4 a. State and explain Norton's theorem. **(06 Marks)**

b. Find the current I_a in the circuit shown in Fig.Q.4(b) by applying superposition theorem. **(08 Marks)**

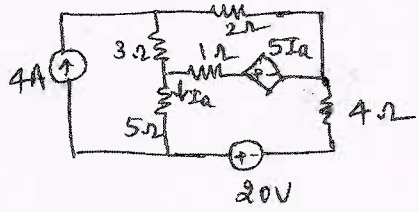

Fig.Q.4(b)

c. Find the current through 16Ω resistance using Morton's theorem for Fig.Q.4(c) **(06 Marks)**

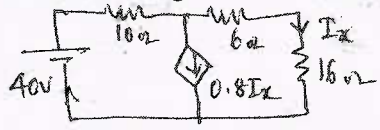

Fig.Q.4(c)

Module-3

5 a. Show that in series resonant circuit the resonant frequency is equal to the geometric mean of half power frequencies. **(06 Marks)**

b. A circuit shown in Fig.Q.5(b), the switch 'K' is changed from position 1 to 2 at t = 0. The steady state having reached before closing the switch. Find the values of $i(t), \frac{di(t)}{dt}$ and $\frac{d^2i(t)}{dt^2}$ at $t = 0^+$ **(08 Marks)**

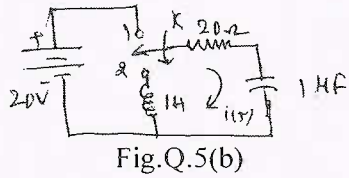

Fig.Q.5(b)

c. A series RLC circuit has R = 2Ω, L = 2mH and C = 10μF. Calculate Q factor, bandwidth, resonant frequency and half power frequencies. **(06 Marks)**

OR

6 a. Show that a parallel resonant circuit will resonate for all frequencies when $R_L = R_C = \sqrt{\frac{L}{C}}$? **(06 Marks)**

b. In the circuit shown in Fig.Q.6(b) initially switch 'K' is kept open for long time. At t = 0, switch K is closed. Obtain the expression for current in the circuit for t > 0.

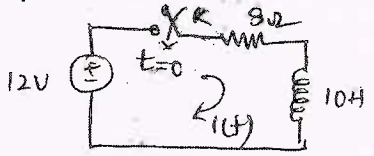

Fig.Q.6(b) **(06 Marks)**

c. Find the value of R_1 such that the circuit shown in Fig.Q.6(c) is resonant.

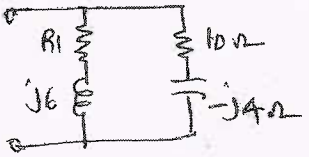

Fig.Q.6(c) **(08 Marks)**

Module-4

7 a. Find the inverse Laplace transform of the following:

i) $F(s) = \frac{s+2}{s(s+3)(s+4)}$ ii) $F(s) = \frac{(s-2)}{s(s+1)^3}$ **(06 Marks)**

b. State and prove initial value and final value theorem. **(08 Marks)**

c. Obtain the Laplace transform of the gate function shown in Fig.Q.7(c) **(06 Marks)**

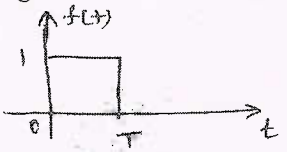

Fig.Q.7(c)

OR

8 a. Using Laplace transform determine the current in circuit shown in Fig.Q.8(a) when switch K is closed at t = 0. Assume zero initial condition. **(06 Marks)**

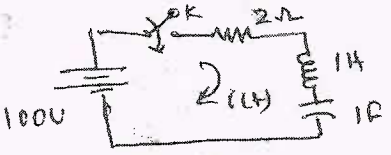

Fig.Q.8(a)

b. Find the Laplace transform of periodic functions shown in Fig.Q.8(b) **(08 Marks)**

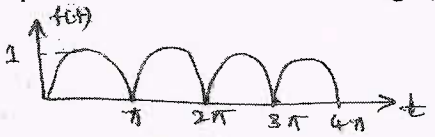

Fig.Q.8(b)

c. Find initial value and final value of the following equations:

i) $F(s) = \frac{s^3 + 7s^2 + 5}{s(s^3 + 3s^2 + 4s + 2)}$ ii) $F(s) = \frac{s(s+4)(s+8)}{(s+1)(s+6)}$ **(06 Marks)**

Module-5

9 a. An unbalanced 3-phase, 4-wire star connected load has balanced voltages of 208V, with ABC phase sequence. Calculate the line currents and neutral current.

$Z_A = 10\Omega; \quad Z_B = 15\angle 30\Omega; \quad Z_C = 10\angle -30°\Omega$ s **(06 Marks)**

b. Derive Z-parameters interms of y and h-parameters. **(08 Marks)**

c. Find Y-parameters for the network shown in Fig.Q.9(c) **(06 Marks)**

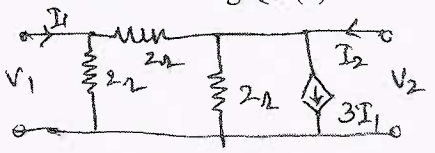

Fig.Q.9(c)

OR

10 a. Determine the line currents and total power supplied to a delta connected load of $Z_{ab} = 10\angle 60°\Omega$, $Z_{bc} = 20\angle 90°\Omega$, $Z_{ca} = 25\angle 30°\Omega$. Assume 3-phase 400V, ABC sequence. **(06 Marks)**

b. Determine the transmission parameters for the networks shown in Fig.Q.10(b).

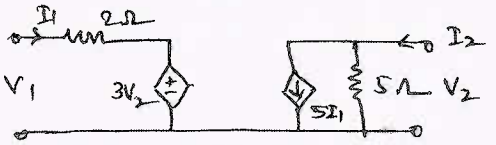

Fig.Q.10(b) **(08 Marks)**

c. Define Z-parameters and Y-parameters and write equivalent circuits. **(06 Marks)**

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17EE33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the Operation Practical Transformer on – load , with the help of phasor diagrams. **(07 Marks)**

b. A single phase , 250/500V Transformer gave the following results :
Open circuit Test : 250V, 1A , 80W on low voltage side.
Short circuit Test : 20V, 12A, 100W on high voltage side.
Calculate the circuit constants and show them on an equivalent circuit. **(08 Marks)**

c. Compare a single unit three – phase transformer with a bank of three single – phase transformer. **(05 Marks)**

OR

2 a. Develop the exact equivalent circuit of a single – phase transformer. From this derive the approximate and simplified equivalent circuits of the transformer. State the assumptions made. **(07 Marks)**

b. Explain how the open and short circuit tests are conducted on transformer to calculate the equivalent circuit parameters. **(07 Marks)**

c. Calculate the ratings and turns ratio of a three – phase transformer to transform 10,000 KVA from 220 KV to 6600V, if the transformer is to be connected in i) $Y - \Delta$ ii) $\Delta - Y$. **(06 Marks)**

Module-2

3 a. Explain with a neat sketch, the Sumpner's test on single phase transformer. **(07 Marks)**

b. Explain the necessity and necessary conditions for parallel operation transformers. **(08 Marks)**

c. An auto transformer supplies a load of 3KW at 115 volts at UPF. If the applied voltage is 230V, calculate the power transferred to the load i) Inductively ii) Conductively. **(05 Marks)**

OR

4 a. Two transformers A and B are joined in parallel to the same load. Determine the current delivered by each transformer, given : Open circuit emf 6600V for A and 6400V for B. Equivalent leakage impedance in terms of secondary $(0.3 + j3)_\Omega$ for A and $(0.2 + j1)_\Omega$ for B. The load impedance is $(8 + j6)_\Omega$. **(08 Marks)**

b. Derive an expression for the saving of copper in auto transformer as compared to an equivalent two winding transformer. **(07 Marks)**

c. Explain with the help of figure, the working of an load tap changing transformer. **(05 Marks)**

Module-3

5 a. What are the purposes for which Tertiary windings are used? **(06 Marks)**

b. Explain with the help of neat sketches, the effects of armature reaction in DC machines. **(08 Marks)**

c. A 3 phase, 16 pole synchronous generator has a resultant air gap flux of 0.06 wb per pole. The flux is distributed sinusoidally over the pole. The stator has 2 slots per pole per phase and 4 conductors per slot are accommodated in two layers. The coil span is 150^0 electrical. Calculate the phase and line induced voltages when the machine runs at 375 rpm. **(06 Marks)**

OR

6 a. What do you mean by three winding transformer? Deduce the equivalent circuit of a 3 – winding transformer. **(06 Marks)**

b. A 4 – pole generator has a wave wound armature with 722 conductors and it delivers 100A on full load. If the brush lead is 8^0, calculate the armature demagnetizing and cross – magnetizing ampere turns per pole. **(06 Marks)**

c. Derive the expressions for pitch factor and distribution factors in connection with alternator armature windings. **(08 Marks)**

Module-4

7 a. What is the necessity and necessary conditions for parallel operation of Alternator? Explain the synchronization of Alternators by synchronizing lamp method. **(08 Marks)**

b. Write a note on 'V' curves of Alternator. **(04 Marks)**

c. Explain with the help of circuit diagram, the slip test on salient pole synchronous machine for determination of direct and quadrature axis synchronous reactants. **(08 Marks)**

OR

8 a. Explain the generator load characteristics. **(06 Marks)**

b. With the help of phasor diagram, explain the concept of two reaction theory for salient pole synchronous machine. **(08 Marks)**

c. Derive the expression for synchronizing power. **(06 Marks)**

Module-5

9 a. Sketch and explain the open circuit and short circuit characteristics of a synchronous machine. **(08 Marks)**

b. From the following test results, determine the voltage regulation of a 2000V, 1 ϕ alternator delivering a current of 100A, at i) UPF ii) 0.8 leading p.f and iii) 0.71 lagging pf.
Test results : Full load current of 100A is produced on short circuit by a field excitation of 2.5A. An emf of 500V is produced on open circuit by the same excitation. The armature resistance is 0.8Ω. **(07 Marks)**

c. What are the causes and effects of hunting? **(05 Marks)**

OR

10 a. Define SCR (Short Circuit Ratio). What is the significance of SCR on performance of synchronous machine? **(07 Marks)**

b. Explain the Synchronous Impedance method of determining the voltage regulation of alternators. **(08 Marks)**

c. What do you mean by Hunting in Alternators? How the effects of Hunting are reduced? **(05 Marks)**

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17EE34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Derive an expression for S_{Ico} and S_{VB} of collector to base bias circuit. **(08 Marks)**

b. Design a suitable Clipper circuit to the output shown in Fig Q1(b). Assume silicon diode.

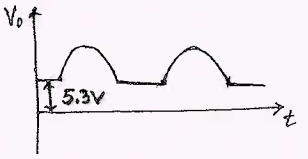

Fig Q1(b) **(05 Marks)**

c. Find I_c, V_E, V_B, V_C and V_{CE} for the circuit shown in Fig 1(c). Assume silicon transistor with $\beta = 60$.

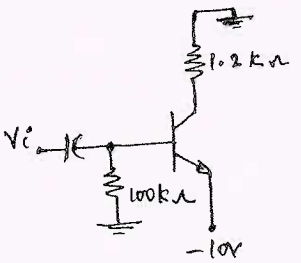

Fig Q1(c) **(07 Marks)**

OR

2 a. Explain how a transistor can be used as a switch. **(07 Marks)**

b. Determine I_E, I_B, V_{CE}, V_{CB}, V_C, and V_E for the network shown in Fig Q2(b). Assume silicon transistor with $\beta = 60$.

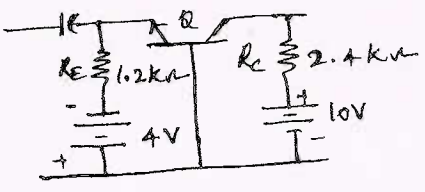

Fig Q2(b) **(07 Marks)**

c. Determine V_o for the network shown in Fig Q2(c) the frequency of i/p signal is 1KHz. Assume ideal diode.

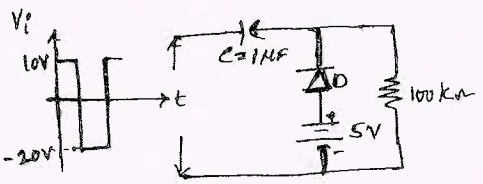

Fig Q2(c) **(06 Marks)**

Module-2

3 a. For the network shown in Fig Q3(a) determine z_i, z_o, A_v and A_I

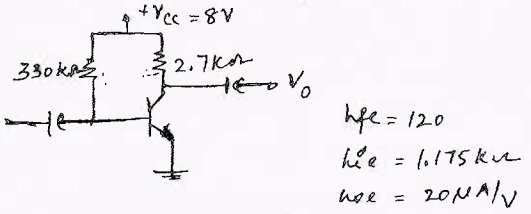

Fig Q3(a) **(08 Marks)**

b. Derive an expression for z_i, z_o, A_v for emitter follower configuration using approximate hybrid model. **(08 Marks)**

c. Obtain the expression for Miller i/p capacitance. **(04 Marks)**

OR

4 a. Draw the complete hybrid equivalent model of a transistor. Derive an expression for z_i, z_o, A_I and A_v. **(10 Marks)**

b. For the common base amplifier shown in Fig Q4(b), determine: i) z_i ii) A_I iii) A_V. Give hie = 1.6kΩ, hfe = 110, hre = 2×10^{-4}, hoe = 20μA/v.

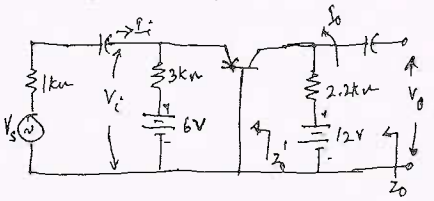

Fig Q4(b) **(10 Marks)**

Module-3

5 a. For the Darlington emitter, follower shown in Fig Q5(a)

i) Calculate the dc bias voltages V_B, V_E, V_c and currents I_B and I_C

ii) Calculate the i/p and o/p impedances

iii) Determine the voltage and current gains

iv) The ac o/p voltage for V_i = 120mV.

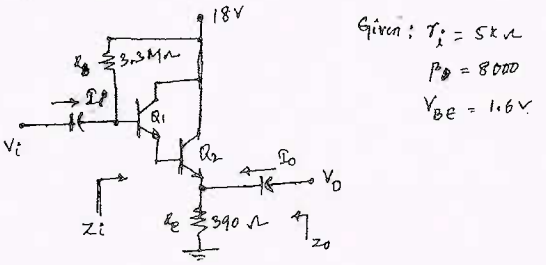

Fig Q5(a) **(10 Marks)**

b. For the cascaded arrangement shown in Fig Q5(b), calculate :

i) The loaded voltage gain of each stage

ii) The total gain of the system A_V and A_{VI}

iii) The loaded current gain of each stage

iv) The total current gain of the system.

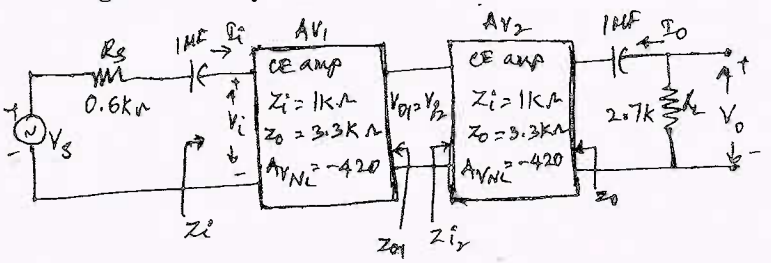

Fig Q5(b) **(10 Marks)**

OR

6 a. List the advantages of negative feedback. **(10 Marks)**

b. Derive an expression for input resistance of current series and current shunt feedback amplifier. **(04 Marks)**

c. Negative feedback to be used to reduce noise from an amplifier by 90% i) what mast the percentage negative feedback to accomplish this, if the initial voltage gain is 50?
ii) What will be the voltage gain with feedback. **(06 Marks)**

Module-4

7 a. Derive an expression for frequency of oscillation of RC phase shift oscillator. **(10 Marks)**

b. With a neat circuit diagram, explain the working of complementary class B power amplifier. **(06 Marks)**

c. The following distortion readings are available for a power amplifier. $D_2 = 0.2$, $D_3 = 0.02$, $D_4 = 0.06$ with $I_1 = 3.3$ A and $R_C = 4\Omega$.
i) Calculate THD ii) Determine the fundamental power iii) calculate the total power **(04 Marks)**

OR

8 a. With a neat circuit diagram, explain the working of Hartley oscillator. **(06 Marks)**

b. For a class B amplifier providing a 20V peak signal to a 16Ω load and a power supply of $V_{CC} = 30V$, determine the i/p power, o/p power and efficiency. **(06 Marks)**

c. Explain the classification of power amplifier based on Q- point. **(08 Marks)**

Module-5

9 a. Draw the circuit a fixed bias JFET amplifier and its equivalent circuit. Hence obtain the expression Z_{in}, Z_0 and A_V. **(10 Marks)**

b. A JFET has device parameter of $g_{mo} = 10m℧$ and $I_{DSS} = 12mA$. When the device is suitably biased, the drain current was found to be 8mA. Determine : i) V_P ii) g_m iii) V_{GS} **(06 Marks)**

c. Give the comparison of FET over BJT. **(04 Marks)**

OR

10 a. With a neat sketch, explain the construction and working principle of N-channel enhancement type MOSFET and also explain its static drain characteristics. **(10 Marks)**

b. Obtain the expression for trans conductance g_m of JFET. **(04 Marks)**

c. For the voltage divider bias configuration shown in Fig Q10(c). Determine the value of R_s, if $V_D = 12V$ and $V_{GSQ} = -2V$.

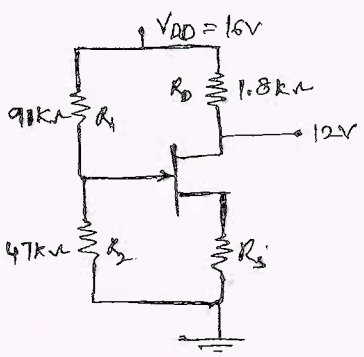

Fig Q10(c) **(06 Marks)**

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17EE35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Digital System Design

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Design a logic circuit that has 4 inputs, the output will only be high, when the majority of the inputs are high. Use K_{map} to simplify. **(10 Marks)**

b. Using K_{maps}, simplify,

$$S = \overline{A}B\overline{C} + A\overline{B}\,\overline{C}\,D + ABCD + ABC\overline{D} + AB\overline{C}\,\overline{E} + ABCE + d(A\,\overline{B}\,C\,\overline{D} + \overline{A}BCE).$$ **(10 Marks)**

OR

2 a. Simply the following function using Quine Mc-Cluskey method.
$P = f(w, x, y, z) = \Sigma m(1, 3, 4, 5, 13, 15) + \Sigma d(8, 9, 10, 11)$. **(10 Marks)**

b. Explain with suitable examples :
i) How do we obtain a standard SOP expression from a SOP expression?
$y = AB + BC + AC$.
ii) How do we obtain a standard POS expression from a POS expression?
$y = (A + B)(B + C)(A + C)$. **(10 Marks)**

Module-2

3 a. Implement the function using active low output dual 2 : 4 line decoder IC 74139.
i) $f_1(P, Q, R) = \Sigma m(1, 4, 5, 7)$
ii) $f_2(P, Q, R) = \pi m(0, 1, 2, 6)$. **(08 Marks)**

b. Design a half and full subtractor and draw using NAND gates only. **(12 Marks)**

OR

4 a. Implement $f(a, b, c, d) = \Sigma m(4, 5, 7, 10, 11, 12, 15)$ using :
i) 8 : 1 MUX with b, c, d as select lines
ii) 4 : 1 MUX with a, d as select lines. **(10 Marks)**

b. Write a truth table for two-bit magnitude comparator. Write the K – Map for each output of two bit magnitude comparator and the resulting equation. **(10 Marks)**

Module-3

5 a. Explain with timing diagrams the workings of SR latch as a switch debouncer. **(08 Marks)**

b. Draw the master Q and $\overline{Q}$ and slave Q and $\overline{Q}$ waveforms for J and K shown in Fig.Q5(b). **(12 Marks)**

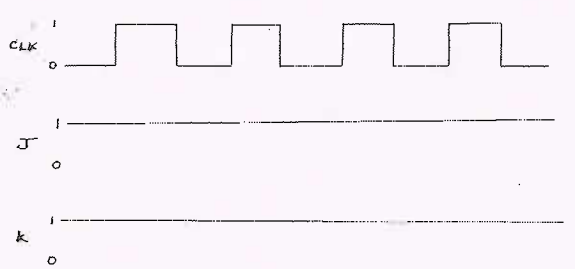

Fig.Q5(b)

OR

6 a. Design a 4 bit shift register using positive edge triggered Dflip-flops to operate as indicated in the table below.

Mode select		Register operation
S_1	S_0	
0	0	Hold
0	1	Clear counter
1	0	Complement contents
1	1	Circular shift right

(10 Marks)

b. Design a Mod-6 ripple counter using clocked T flip-flops. **(10 Marks)**

Module-4

7 a. Explain mealy model and Moore model in detail with necessary block diagrams. **(08 Marks)**

b. Analyse the following sequential circuit shown in Fig.Q7(b) and obtain :

i) Flip flop input and output equations
ii) Transition equation
iii) Transition table
iv) State table
v) State diagram.

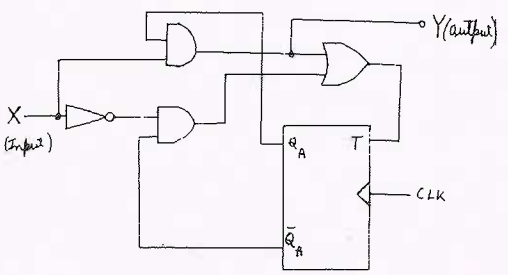

Fig.Q7(b)

(12 Marks)

OR

8 a. For the state diagram shown in Fig.Q8(a), design a sequential circuit using Dflip-flop. **(10 Marks)**

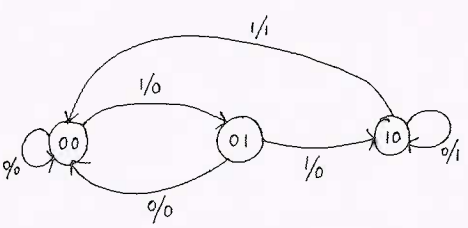

Fig.Q8(a)

b. Design a synchronous counter using Negative edge triggered Dflip-flop having the sequence : 1 – 6 – 12 – 10 – 5 – 3 – 7 – 2 – 13 – 4 – 1. **(10 Marks)**

Module-5

9 a. Explain briefly the structure of the VHDL module. **(10 Marks)**

b. Briefly explain the operators in VHDL. **(10 Marks)**

OR

10 a. For a 2 × 1 multiplexer with active low enable, write a VHDL dataflow description and verilog description. **(12 Marks)**

b. Give the comparison between concurrent and sequential signal assignment statements. **(08 Marks)**

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CBCS SCHEME

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17EE36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electrical and Electronic Measurement

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the balancing equation for Kelvin's double bridge. **(08 Marks)**

b. Explain how to measure earth resistance by using Megger. **(06 Marks)**

c. The energy stored in a parallel plate capacitor per unit volume is given by $W = K\varepsilon^a V^b d^c$, where d = distance between the plates, V = voltage between the plates, ε = permittivity of the medium and K = constant. Find the values of a, b and c by dimensional analysis. **(06 Marks)**

OR

2 a. Define the sensitivity of Wheatstone's bridge with the necessary circuit diagram. Hence deduce the expression for the sensitivity of the bridge 'SB'. **(07 Marks)**

b. The four arms of a Maxwell's inductance bridge consist of the following elements. Arm AB consists of an inductive coil of resistance r_1 and inductance L_1 in series with a variable resistance R_1. Arms BC and CD consists of standard resistance of 100Ω each. Arm DA consists of a standard variable pure inductor L_2 and a variable resistance R_2. Balance is obtained when L_2 = 50.6 mH, R_1 = 2.4 Ω and R_2 = 42.4Ω. Find the resistance and inductance of the coil in the arm AB. The detector is connected between B and D. The supply is connected between A and C. **(05 Marks)**

c. Obtain the balance equation for Hay's bridge used for measurement of unknown inductance. Draw the phasor diagram at balance condition. **(08 Marks)**

Module-2

3 a. Derive the torque equation of single phase electrodynamometer type wattmeter. **(08 Marks)**

b. What are the errors and adjustments in dynamometer type wattmeter? **(04 Marks)**

c. Explain the working principle and construction of three phase electrodynamometer power factor meter. **(08 Marks)**

OR

4 a. With the help of neat sketch, explain the construction and working of Weston frequency meter. **(08 Marks)**

b. The name plate of a single phase energymeter reads as 250 V, 20 A, 1800 rev/KWH. The meter is tested at $3/4^{th}$ load and u.p.f. The meter makes 20 revolutions in 10 seconds. Determine the % error in the reading of energy meter. **(06 Marks)**

c. Explain in detail the errors and adjustments in single phase energy meters. **(08 Marks)**

Module-3

5 a. Explain the operation of the comparative deflection method of testing a current transformer by Silsbee's method. **(08 Marks)**

b. What do you mean by shunts and multipliers and derive the expression for shunts and multipliers? **(08 Marks)**

c. Discuss the advantages of instrument transformers. **(06 Marks)**

OR

6 a. Explain the measurement of magnetizing force by ballistic galvanometer and a search coil with a neat diagram. **(08 Marks)**

b. The exciting current of a ring core current transformer of ratio 500/4 A is 2A at a power factor of 0.5, when operating at full primary current. If secondary burden is a non-inductive resistance of 2Ω, find: (i) Phase angle of the current transformer and (ii) Ration error at full load, assuming that there is no turns compensation. **(06 Marks)**

c. Explain the measurement of flux/flux density using search coil. **(08 Marks)**

Module-4

7 a. Explain with the help of neat block diagram the function of integrating type digital voltmeter. **(08 Marks)**

b. Explain the operation of true RMS reading voltmeter. **(08 Marks)**

c. Write a note on performance parameters of digital voltmeter. **(06 Marks)**

OR

8 a. With a neat block diagram, explain the principle of working of electronic energy meter. List the drawback of traditional energy meter. **(08 Marks)**

b. With a neat sketch explain the working of Q-meter. **(06 Marks)**

c. With a neat sketch explain the working of electronic multimeter. **(06 Marks)**

Module-5

9 a. With a neat sketch, explain the working of the following and list its advantages and disadvantages:

(i) Liquid Crystal Display (LCD)

(ii) Nixie tube display **(12 Marks)**

b. With a neat sketch explain the working of the following:

(i) Cathode Ray Tube

(ii) LED **(08 Marks)**

OR

10 a. With a neat sketch, explain the working of x-y recorders and bridge type recorders. **(10 Marks)**

b. With a neat sketch explain the working of the following:

(i) Ultra-violet recorders

(ii) Electro Cardio Graph (ECG) **(10 Marks)**

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18EE32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Setup nodal equations for the circuit of Fig.Q1(a) and then find the power supplied by 5 – V source.

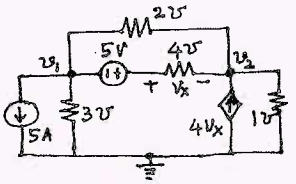

Fig.Q1(a) **(08 Marks)**

b. Making use of source shifting procedure, simplify the circuit of Fig.Q1(b) in such a way that the voltage V_X is determined.

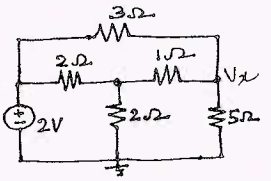

Fig.Q1(b) **(06 Marks)**

c. Use mesh analysis to determine the branch currents in the network indicated in Fig.Q1(c).

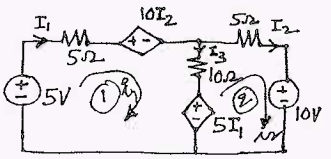

Fig.Q1(c) **(06 Marks)**

OR

2 a. Find 'Req' for the network shown in Fig.Q2(a) across A and B.

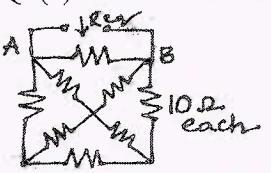

Fig.Q2(a) **(06 Marks)**

b. Draw the exact dual of the network shown in Fig.Q2(b) by writing Kirchhoff's law equations.

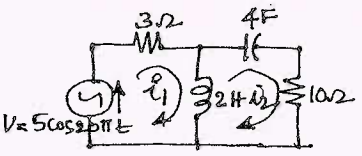

Fig.Q2(b) **(08 Marks)**

c. Reduce the network of Fig.Q2(c) to a form with only one current source across terminals using source transformation (terminals A and B).

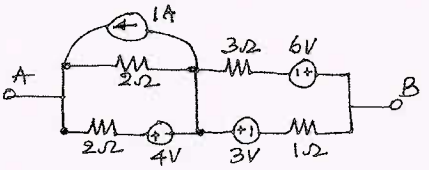

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Find the Thevenin's equivalent circuit at the terminals A and B of the circuit in Fig.Q3(a).

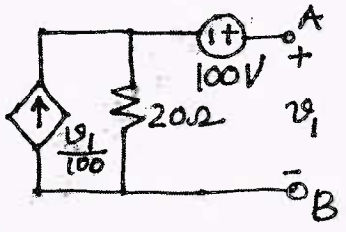

Fig.Q3(a)

(08 Marks)

b. Find the value of R_L in the network shown in Fig.Q3(b) that will absorb a maximum power and specify the value of that power.

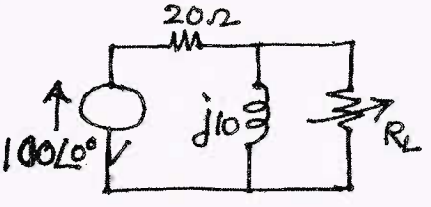

Fig.Q3(b) **(06 Marks)**

c. In the network shown in Fig.Q3(c) the voltage source of 5V causes a current I in the 2Ω resistor. Find 'I'. Verify the reciprocity theorem.

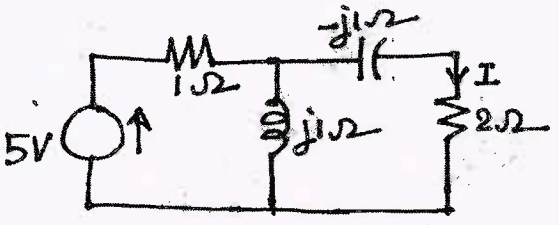

Fig.Q3(c)

(06 Marks)

OR

4 a. In the network shown in Fig.Q4(a) determine the nodal voltage V_2 using superposition theorem.

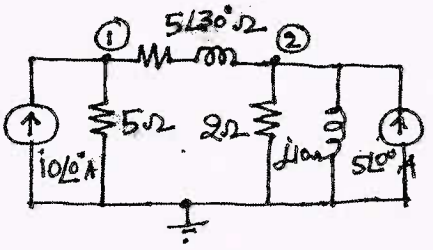

Fig.Q4(a) **(08 Marks)**

b. Use Thevenin's theorem to find current in $R_L = 6\Omega$ in Fig.Q4(b).

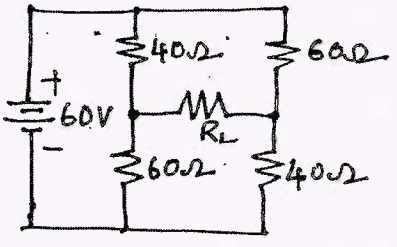

Fig.4(b) **(08 Marks)**

c. State and prove Millman's theorem. **(04 Marks)**

Module-3

5 a. Derive an expression for resonant frequency 'f_0' for the general parallel resonant circuit show in Fig.Q5(a).

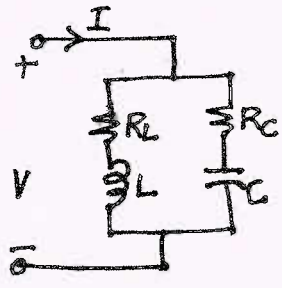

Fig.Q5(a)

(08 Marks)

b. Fig.Q5(b) shows a network with zero capacitor voltage and zero inductor current when the switch 'K' is open. At t = 0 the switch 'K' is closed. Solve for :

i) V_1 and V_2 at $t = 0^+$

ii) $\frac{dv_1}{dt}$ and $\frac{dv_2}{dt}$ and $t = 0^+$

iii) V_1 and V_2 at $t = \infty$

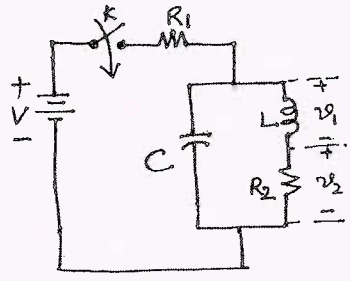

Fig. Q5(b)

(12 Marks)

OR

6 a. Fig.Q6(a) shows a RCL parallel circuit excited by a DC current source. At t = 0, the switch K is opened. Find v(t).

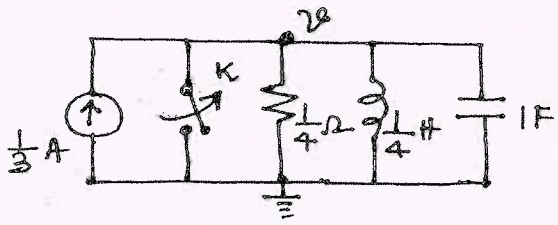

Fig.Q6(a)

(08 Marks)

b. A 400V, 200Hz AC source is connected in series with a capacitor and a coil whose resistance and inductance are 20mΩ and 6mH respectively. If the circuit is in resonance at 200Hz, find :

i) Value of capacitor

ii) V_g A/C the capacitor

iii) Maximum energy stored (instantaneous) in the coil

c. iv) The half – power frequencies. **(08 Marks)**

What are initial conditions in network? Write the equivalent form of the network elements interms of the initial conditions. **(04 Marks)**

Module-4

7 a. Find the Lapalce transform of the square wave shown in Fig.Q7(a).

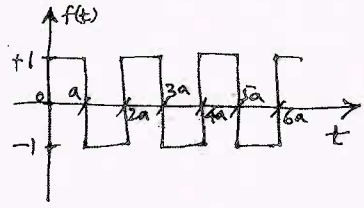

Fig.Q7(a) **(08 Marks)**

b. Fig.Q7(b) shows a series R–L–C circuit excited by a voltage v(t) = 12 sin 5t. The initial current in the circuit is 5A and the initial voltage a/c capacitor is one volt with polarity shown. Find i(t) using Lapalce transformation method.

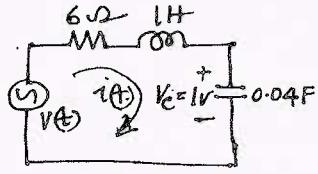

Fig.Q7(b) **(08 Marks)**

c. State and prove the initial–value theorem in the context of Lapalce transformation. **(04 Marks)**

OR

8 a. A rectangular voltage pulse of unit height and duration 'T' is applied to a series R–C combination at t = 0. Determine the voltage across the capacitance 'C' as a function of time. Use Laplace transformation method. **(10 Marks)**

b. Find the Laplace transforms of the two different functions given below and sketch the waveforms. i) sin (wt) u(t t_0) ii) sin w(t – t_0) u(t – t_0). **(10 Marks)**

Module-5

9 a. A symmetrical 3 - ϕ, 100V, 3-wire supply feeds an unbalanced star-connected load with impedances of the load as ZR = $5\angle 0°$ Ω, ZY = $2\angle 90°$ Ω and ZB = $4\angle -90°$ Ω. Find the line currents, voltage across the impedances and the displacement natural voltage. Also calculate the power consumed by the load. Draw the phasor diagram sequence RYB. Take VRY as ref. **(10 Marks)**

b. For the circuit of Fig.9(b) find Z-parameters. Hence calculate transmission (ABCD) parameters. Find whether the network is symmetrical? Reciprocal?

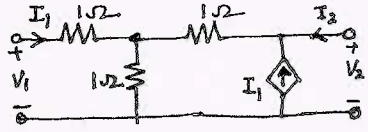

Fig.Q9(b) **(10 Marks)**

OR

10 a. A 3-ϕ delta connected load has Z_{RY} = (100 + j50)Ω, Z_{YB} = (20 – j75)Ω and Z_{BR} = (70.7 + j70.7)Ω and it is connected to balanced 3 - ϕ, 400V supply. Determine the line currents, power consumed by the load. Sketch the phasor diagram. Assume RYB phase sequence and take V_{YB} as the reference phasor. **(10 Marks)**

b. For the circuit shown in Fig.Q10(b) find Y-parameters. Is the network symmetrical? Reciprocal?

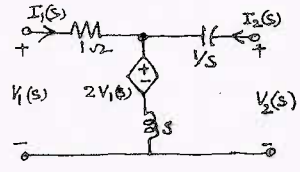

Fig.10(b) **(10 Marks)**

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CBCS SCHEME

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18EE33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Develop an exact equivalent circuit diagrams of a single phase transformer referred to both primary and secondary sides indicating all the parameters. **(08 Marks)**

b. A 5 KVA , 500/250V , 50Hz , 1 ϕ transformer gave the following readings :
O.C. Test : 500V , 1A , 50W (HV side)
S.C. Test : 25V , 10A , 60W (LV side shorted)
Determine : i) Circuit constants ii) The efficiency on full load , 0.8 lagging p.f
iii) The voltage regulation on full load , 0.8 leading p.f
iv) Draw the equivalent circuit. **(08 Marks)**

c. Mention the advantages of single 3 ϕ transformers over bank of single phase transformers. **(04 Marks)**

OR

2 a. Explain with the help of connection and phasor diagrams, how Scott connections are used to obtain two phase supply from three – phase supply mains. **(08 Marks)**

b. A 3 phase, 1000 KVA, 6600/1100V, transformer is delta connected on the primary and star connected on the secondary, the primary resistance per phase is 1.8Ω and secondary resistance per phase is 0.025Ω. Determine the efficiency when the secondary is supplying full load at 0.8 p.f. and the iron loss is 15KW. Also determine the efficiency on full load unity p.f. **(08 Marks)**

c. Write a note on voltage regulation and its significance of a single phase transformer. **(04 Marks)**

Module-2

3 a. Analyze the performance of transformers by conducting Sumpner's test with relevant circuit diagram. **(07 Marks)**

b. Derive an expression for the currents and load shared by two transformers connected in parallel supplying a common load , when no load voltages are unequal. **(07 Marks)**

c. Two single phase transformers A and B are connected in parallel. They have same KVA ratings but their resistances are respectively 0.05 and 0.1 per unit and their leakage reactance 0.05 and 0.04 per unit. If A is operated on full load at a p.f. of 0.8 lagging , what will be the load and p.f. of B. **(06 Marks)**

OR

4 a. What is an Auto Transformer? Derive an expression for saving of copper in auto transformer compared to two windings transformer also write its applications. **(10 Marks)**

b. With the help of neat sketches, explain the working ON load tap changer and OFF load tap changer. **(10 Marks)**

Module-3

5 a. Draw and explain the equivalent circuit of tertiary transformer. **(06 Marks)**

b. Discuss the armature reaction in D.C. machines and derive the equations for AT_d/pole and AT_c/pole. **(08 Marks)**

c. A 6 pole , 148 A, dc shunt generator has 480 conductors and is wave wound. Its field current is 2 A. Find the demagnetising and cross magentising amper – turns / pole at full load if
i) The brushes are at the GNA.
ii) The brushes are shifted from GNA by 5^0 electrical.
iii) The brushes are shifted from GNA by 5^0 mechanical. **(06 Marks)**

OR

6 a. Explain in detail cooling of transformers. **(06 Marks)**

b. Derive EMF equation of synchronous generator and give the expression for pitch factor and distribution factor. **(08 Marks)**

c. A , 3ϕ , 8 pole , star connected alternator has the armature coils short chorded by one slot. The coil span is 165^0 electrical. The alternator is driven at the speed of 750 rpm. If there are 12 conductors per slot and flux per pole is 50 mwb. Calculate the value of induced phase and line voltages. **(06 Marks)**

Module-4

7 a. Explain the short circuit ratio and its significance of an alternator. **(08 Marks)**

b. Enumerate the various methods available for determining the voltage regulation. Explain in details EMF and MMF methods. **(12 Marks)**

OR

8 a. Explain Zpf method of predetermination of voltage regulation of alternator. Mention the advantages of this method. **(08 Marks)**

b. The open circuit and short circuit test results for 3ϕ , star connected , 1000 KVA , 1905V, 50Hz alternators are

I_f in Amps	10	20	25	30	40	50
V_{oc} line volts	760	1500	1700	1905	2300	2600
I_{sc} in Amps	-	220	-	335	-	-

The armature reactance per phase is 0.2Ω. Draw the O.C and S.C characteristics and find the voltage regulation on full load 0.8 logging p.f. by
i) Amper _turn method ii) Synchronous impedance method. **(12 Marks)**

Module-5

9 a. With a neat circuit diagram, explain the slip test on salient pole synchronous machine to determine Xd and Xq from the slip – test. **(10 Marks)**

b. The single phase alternators operating in parallel have induced emfs on open circuit of $230\angle 0^0$ and $230 \angle 10^0$ volts and respective reactances of j2Ω and j3Ω. Calculate i) Terminal voltage ii) Current iii) Power delivered by each of the alternators to a load of impedance 6Ω (reactive). **(10 Marks)**

OR

10 a. Discuss the concept of two – reaction theory in a salient pole synchronous machine with the help of phasor diagram. **(08 Marks)**

b. Write a note on capability curves of synchronous generator. **(06 Marks)**

c. Discuss about hunting in synchronous machines. Also explain the role of damper windings. **(06 Marks)**

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CBCS SCHEME

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18EE34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Analog Electronics Circuits

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Draw a double ended clipper circuit and explain the working principle with transfer characteristics. **(10 Marks)**

b. Draw and explain the working of clamper circuit which clamps the positive peak of a signal to zero. **(10 Marks)**

OR

2 a. Derive the expression for stability factors S′ and S″ for fixed bias circuit. **(08 Marks)**

b. A voltage divider biased circuit has $R_1 = 39K\Omega$, $R_2 = 82K\Omega$, $R_C = 3.3K\Omega$, $R_E = 1K\Omega$ and $V_{CC} = 18V$. The silicon transistor used has $\beta = 120$. Find Q-point and stability factor. **(07 Marks)**

c. Explain the operation of transistor as switch with suitable circuit and necessary waveforms. **(05 Marks)**

Module-2

3 a. State and prove Millers theorem. **(06 Marks)**

b. Compare the characteristics of CB, CE and CC configurations. **(06 Marks)**

c. For the collector feedback configuration having $R_F = 180K\Omega$, $R_C = 2.7K\Omega$, $C_1 = 10\mu F$, $C_2 = 10\mu F$, $\beta = 200$, $r_0 = \infty\Omega$ and $V_{CC} = 9$volts. Determine the following parameters:
i) re ii) z_i iii) z_o iv) A_v **(08 Marks)**

OR

4 a. Derive suitable expression to explain the effect of cascading of amplifiers on lower and upper cut off frequencies. **(08 Marks)**

b. Derive equations for miller input capacitance and miller output capacitance. **(08 Marks)**

c. A transistor in CE mode has h-parameters $h_{ie} = 1.1K\Omega$, $h_{re} = 2 \times 10^{-4}$, $h_{fe} = 100$ and $h_{oe} = 25\mu A/V$. Determine the equivalent CB parameters. **(04 Marks)**

Module-3

5 a. Derive expression for Zi and Ai for a Darlington Emitter follower circuit. **(10 Marks)**

b. Explain the need of a cascading amplifier. Draw and explain the block diagram of two stage cascade amplifier. **(06 Marks)**

c. Write a note on cascade amplifier. **(04 Marks)**

OR

6 a. List the general characteristics of negative feedback amplifier. **(04 Marks)**

b. A given amplifier arrangement has the following voltage gain $AV_1 = 10$, $AV_2 = 20$ and $AV_3 = 40$. Calculate the overall voltage gain and determine the total voltage gain in dBS. **(08 Marks)**

c. For the voltage series feedback amplifier. Derive an expression for output impedance (Resistance). **(08 Marks)**

Module-4

7 a. Show that maximum efficiency of class-B push pull amplifier (power amplifier) circuit is 78.54%. **(08 Marks)**

b. Explain the classification of power amplifier with a neat circuit diagram and waveforms. **(07 Marks)**

c. A class-B push pull amplifier operating with $V_{CC} = 25V$ provides a 22V peak signal to 8Ω load. Calculate the circuit efficiency and power dissipated per transistor. **(05 Marks)**

OR

8 a. Draw the circuit of wein bridge oscillator and explain its operation. **(10 Marks)**

b. With a neat circuit diagram and waveform, explain the working principal of crystal oscillator operating in series resonant mode. A crystal has the following parameters L = 0.334H, C = 0.065pF and R = 5.5KΩ. Calculate its resonant frequency. **(10 Marks)**

Module-5

9 a. With the help of neat diagram, explain the working and characteristics of N-channel JFET. **(10 Marks)**

b. For a self bias JFET circuit, $V_{DD} = +12V$, $R_D = 2.2K\Omega$, $R_G = 1M\Omega$, $R_S = 1K\Omega$, $I_{DSS} = 8mA$, $V_P = -4$ Volts. Determine the following parameters: i)V_{GS} ii) I_D iii) V_{DS} iv) V_S v) V_G vi) V_D **(10 Marks)**

OR

10 a. With neat sketches, explain the operation and characteristics of n-channel depletion type MOSFET. **(10 Marks)**

b. Derive expression for V_{GS}, I_D, V_{DS}, V_D and V_S for a voltage divider bias circuit using FET. **(10 Marks)**

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18EE35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Digital System Design

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Write the truth table of the logic circuit having and inputs a, b and c and an output $y = ab\bar{c} + \bar{a}bc + abc$. Also simplify the Boolean expression and implement the logic circuit using NAND gates only. **(06 Marks)**

b. Minimize the following multiple output functions using K-map
i) $f_1(a, b, c, d) = \Sigma m(1, 5, 7, 8, 9, 10, 11, 13, 15)$
ii) $f_2(a, b, c, d) = \Sigma m(1, 2, 6, 7\ 8, 13, 14, 15) + \Sigma d(3, 5, 12)$. **(10 Marks)**

c. Define Canonical Minterm form and canonical Maxterm form. **(04 Marks)**

OR

2 a. Convert the following Boolean function into their proper canonical form in decimal notation.
i) $f = \bar{a}b + bc$ ii) $f = (\bar{x} + y)(y + \bar{z})$. **(08 Marks)**

b. Simplify using Quine-Mccluskey minimization technique for the following function.
$f(w, x, y, z) = \Sigma(0, 1, 4, 5, 9, 11, 13, 15)$. **(12 Marks)**

Module-2

3 a. Design a combinational circuit that will multiply two 2-bit numbers. **(12 Marks)**

b. Implement full subtractor using 3 : 8 line decoder with active high outputs and active low enable input. **(08 Marks)**

OR

4 a. Implement the following using 8 to 1 MUX with a, b, c as select lines
$f(a, b, c, d) = \Sigma(0, 1, 5, 6, 7, 9, 10, 15)$ **(08 Marks)**

b. Implement a 1-bit comparator using 2 : 4 decoder 74139. **(04 Marks)**

c. Design a priority encoder for a system with three inputs, with the middle bit with highest priority encoding to 10, the MSB with the next priority encoding to 11, while the LSB with the least priority encoding to 01. **(08 Marks)**

Module-3

5 a. With a neat diagram, explain the working of master–slave JK flip-flop along with waveforms. **(10 Marks)**

b. Explain switch debouncer using SR latch with waveforms. **(10 Marks)**

OR

6 a. Write the characteristic equation of SR, JK, D and T flip-flops. **(08 Marks)**

b. Differentiate sequential logic circuit and combinational logic circuit. **(04 Marks)**

c. Explain the operation of SR latch with an example. **(08 Marks)**

Module-4

7 a. Design a 4-bit register using positive edge triggered D-flip-flop to operate as indicated in the table below :

Mode select		Data line selected	Register operation
a_1	a_0		
0	0	d_0	Hold
0	1	d_1	Shift right
1	0	d_2	Shift left
1	1	d_3	Parallel load

(12 Marks)

b. Design a 4-bit mod-8 Johnson counter and also write the count sequence table. **(08 Marks)**

OR

8 a. Design a 4-bit binary ripple up counter using positive edge triggered t-flip-flop with a count enable line. Write the counting sequence and relevant timing diagram. **(08 Marks)**

b. Design a synchronous counter to count the sequence 0, 1, 4, 6, 7, 5 and repeat using positive edge triggered JK flip-flops. **(12 Marks)**

Module-5

9 a. Explain Mealy and Moore model in a sequential circuit analysis. **(08 Marks)**

b. Design a sequential circuit using D-flip-flop for the state diagram. Show below in Fig.Q9(b). **(12 Marks)**

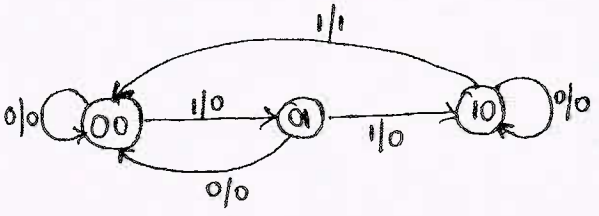

Fig.Q9(b)

OR

10 a. Construct the excitation table, transition table, state table and state diagram for the Moore sequential circuit shown in Fig.Q10(a). **(12 Marks)**

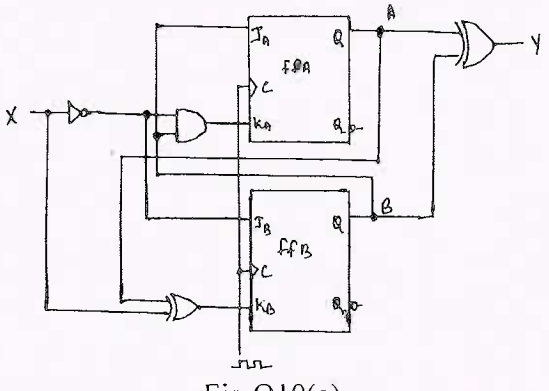

Fig.Q10(a)

b. Write short notes on :
i) ROM ii) RAM iii) EPROM iv) Flash Memory. **(08 Marks)**

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18EE36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electrical and Electronic Measurements

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define 'Voltage Sensitivity' of a Galvanometer. Obtain an expression for bridge sensitivity S_b in terms of voltage sensitivity and bridge parameters. When will the bridge sensitivity be maximum? **(07 Marks)**

b. Explain the necessity of Earthing. Explain measurement of Earth Resistance by fall of potential method. **(06 Marks)**

c. Explain Maxwell Inductance capacitance bridge and derive its balance equation. **(07 Marks)**

OR

2 a. Explain the significance of 'low resistance' measurement. With a neat circuit diagram, explain Kelvin Double Bridge and derive its balance equation. **(08 Marks)**

b. The four arms of an ac bridge have impedance values of $Z_1 = 400\angle 50^\circ$ ohm, $Z_2 = 200\angle 40^\circ$ ohm, $Z_3 = 800\angle -50^\circ$ ohm and $Z_4 = 400\angle 20^\circ$ ohm. Find whether the bridge is balanced under this working condition. **(04 Marks)**

c. With a neat circuit diagram, explain modified De-Sauty bridge for measurement of capacitance of an imperfect capacitor and derive its balance equation. **(08 Marks)**

Module-2

3 a. Derive the torque equation of a single phase Dynamometer type Wattmeter. **(07 Marks)**

b. Explain the various adjustments required in Energy meter for the accurate reading. **(06 Marks)**

c. With a neat sketch, explain the construction and working of a single phase Dynamometer type Power Factor meter. **(07 Marks)**

OR

4 a. Explain: i) Phase sequence Indicators ii) Determination of power factor of a balanced three phase load, using Wattmeter readings W_1 and W_2 obtained from two Wattmeter method of power measurement. **(08 Marks)**

b. Explain the various errors and adjustments in Dynamometer type Wattmeter. **(06 Marks)**

c. With a neat sketch, explain the construction and working of Weston frequency meter. **(06 Marks)**

Module-3

5 a. What are shunts and multipliers? Derive expressions to find the required values of shunts and multipliers. **(06 Marks)**

b. What are Instrument Transformers? Differentiate between Current Transformers and Power Transformers. **(06 Marks)**

c. Explain the current transformer with the help of an equivalent circuit diagram and a phasor diagram, write expressions for 'ratio error' and 'phase angle error' of a CT. **(08 Marks)**

OR

6 a. Explain what is meant by testing of Instrument Transformers, with a neat circuit diagram explain silsbee's method of testing CT. **(06 Marks)**

b. State the advantages and disadvantages of using Instrument transformers. **(06 Marks)**

c. Describe experimental method of measurement of flux density in a Ring specimen of magnetic material using ballistic galvanometer. **(08 Marks)**

Module-4

7 a. What are the advantages of electronic instruments? **(04 Marks)**

b. Explain the construction and working principle of a true RMS Reading Voltmeter. **(08 Marks)**

c. Explain the construction and working of a RAMP type digital voltmeter. **(08 Marks)**

OR

8 a. Explain, what are Q meters? **(04 Marks)**

b. Explain the construction and working of a successive approximation type DVM. **(08 Marks)**

c. Explain the principle and working of an electronic energy meter with a block diagram. What are the advantages of electronic energy meters over conventional Electromechanical Energy Meters? **(08 Marks)**

Module-5

9 a. Explain with suitable sketch, working of a Cathode Ray Tube (CRT). **(06 Marks)**

b. Explain the principle and operation of (i) Strip chart recorders (ii) Galvanometer recorders. **(08 Marks)**

c. Write a note on Display Devices. **(06 Marks)**

OR

10 a. Explain with a neat sketch ECG recorders? **(08 Marks)**

b. Write notes on: i) LEDs ii) LCDs. **(06 Marks)**

c. Explain what are: i) Nixes ii) Liquid Vapour Devices. **(06 Marks)**

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15EE43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Transmission & Distribution

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Describe the different types of supporting structures used in transmission lines and discuss the advantages of HVDC transmission systems. **(08 Marks)**

b. Define Sag and explain its importance, also derive an expression for sag of a transmission line when supports are at the same level. **(08 Marks)**

OR

2 a. Indicate a string of 3 insulators and derive an expressions for string efficiency of 3 discs. **(08 Marks)**

b. A 3ϕ overhead transmission line is being supported by 3 discs of suspension insulator the potential across the 1st and 2nd insulator are 8 KV and 11 KV respectively, calculate (i) The line voltage (ii) String efficiency. **(08 Marks)**

Module-2

3 a. Determine the inductance of conductor due to internal flux. **(08 Marks)**

b. In a single phase line as shown in Fig.Q3 (b), conductors 'a' and 'a'' in parallel from one conductor while conductors 'b' and 'b'' in parallel from the return path. Calculate the total inductance of the line/km, assuming that current is equally shared by the two parallel conductors. Conductor diameter is 2.0 cm. **(08 Marks)**

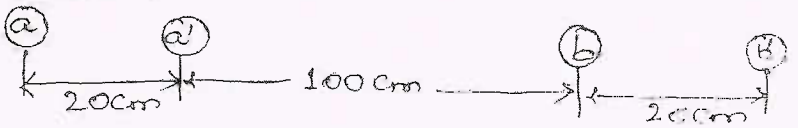

Fig. Q3 (b)

OR

4 a. Derive an expression for capacitance of 1ϕ line. **(08 Marks)**

b. A 3ϕ, 50 Hz, 66 kV overhead line conductors are placed in a horizontal plane as shown in Fig. Q4 (b). The conductor diameter is 1.25 cm. The line length is 100 km. Calculate the capacitance per phase and charging current per phase. Assume complete transposition of the lines. **(08 Marks)**

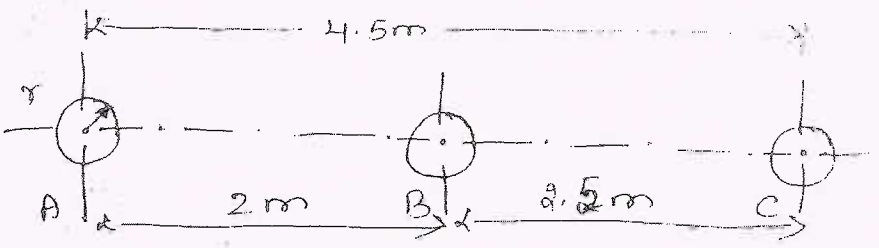

Fig. Q4 (b)

Module-3

5 a. What are generalized circuit constants of a transmission line? Determine the ABCD constants of a medium transmission line using nominal T-model and prove AD-BC = 1. **(08 Marks)**

b. A medium single phase transmission line 100 km long has the following constants:
Resistance /km/ph = 0.15 Ω
Inductive reactance /km/ph = 0.377 Ω
Capacitive reactance /km/ph = 31.87 Ω
Receiving end line voltage = 132 KV
Assuming that the total capacitance of the line is localized at the receiving end alone, determine
(i) Sending end current (ii) Line value of sending end voltage
(iii) Regulation (iv) Sending end p.f.
The line is delivering 72 MW at 0.8 p.f. lagging. **(08 Marks)**

OR

6 a. Write a short notes on classification of transmission lines. Also explain voltage regulation and transmission efficiency with suitable formula. **(08 Marks)**

b. A 3ϕ, 50 Hz, 16 km long overhead line supplies 1000 kW at 11 kV, 0.8 p.f. lagging. The line resistance is 0.03 Ω perphase per km and line inductance is 0.7 mH per phase km. Calculate the sending end voltage, voltage regulation and efficiency of transmission. **(08 Marks)**

Module-4

7 a. What is Corona? State and explain with the expression for disruptive critical voltage and visual critical voltage. **(08 Marks)**

b. Write a note on factors affecting the corona and methods to reduce it. **(08 Marks)**

OR

8 a. Draw the cross sectional view of a single core cable and explain its construction. **(08 Marks)**

b. Derive an expression for insulation resistance of a single core cable. **(08 Marks)**

Module-5

9 a. Explain radial distribution system. State its merits and demerits. **(08 Marks)**

b. A two conductor copper cable is loaded as shown in figure below in Fig. Q9 (b). Both the ends are fed at the same voltage of 250 V DC. Calculate:
(i) The point of minimum potential.
(ii) The current in each section.
(iii) The voltage at load points. The resistance of copper is 0.8 Ω per km for go and return wires put together. **(08 Marks)**

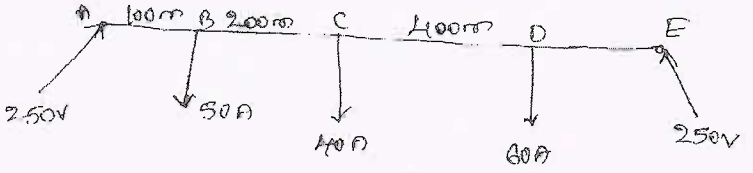

Fig. Q9 (b)

OR

10 a. Write a short note on:
(i) Bath tub curve (ii) Weibull distribution (iii) MTTF and MTBF **(08 Marks)**

b. What are the limitations of distribution system? **(08 Marks)**

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15EE44

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electric Motors

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the principles of torque production in dc motor and derive the torque equation of a dc motor. **(06 Marks)**

b. With the help of relevant characteristic, explain why a series motor should never be started at no load. **(05 Marks)**

c. A shunt wound motor has a armature resistance of 0.1Ω. It is connected across 220V supply. The armature current taken by the motor is 20A and the motor runs at 800rpm. Calculate additional resistance to be inserted in series with the armature to reduce speed to 520rpm. Assume that there is no change in armature current. **(05 Marks)**

OR

2 a. With a neat sketch, explain the Ward-Leonard method of speed control of DC motor. **(06 Marks)**

b. Explain the different types of losses in a DC motor. **(04 Marks)**

c. A 250V, 15kW DC shunt motor has a maximum efficiency of 88% and a speed of 700rpm, when delivering 80% of its rated output. The resistance of its shunt field is 100Ω. Determine the armature resistance. **(06 Marks)**

Module-2

3 a. A 400V, DC shunt motor when running on no load takes 5A. Armature resistance (including brushes) is 0.5Ω and shunt field resistance is 200Ω. Find the output in KW and efficiency of the motor when running on full load and taking a current of 50A. **(05 Marks)**

b. Explain back to back test on two identical DC machines and calculate the efficiency of the machines as a generator and motor. **(07 Marks)**

c. Explain the advantages and disadvantages of field's test applied to two similar DC series motors. **(04 Marks)**

OR

4 a. Derive an expression for rotor copper losses in terms of slip and rotor input. **(05 Marks)**

b. The power input to the rotor of 440V, 50Hz 6 pole 3 phase induction motor is 80kW. The rotor emf is observed to make 100 complete alternations per minute. Calculate: i) the slip ii) the rotor speed iii) the mechanical power developed. **(05 Marks)**

c. Draw and explain the torque characteristics for 3 phase induction motor covering motoring, generating and braking regions of operation. **(06 Marks)**

Module-3

5 a. Draw and explain the phasor diagram of induction motor at slip S. **(06 Marks)**

b. A 50kW, 6 pole, 50Hz, 450V, 3ϕ slip ring induction motor gave the following test data (line values).
No load test : 450V, 20A, p.f. = 0.15
Blocked rotor test : 200V, 150A, p.f. = 0.3
The ratio of stator to rotor copper losses on short circuit was 5:4. Draw the circle diagram and determine:
i) Line current
ii) Power factor
iii) Slip at full load
iv) Efficiency at full load. **(10 Marks)**

OR

6 a. With a neat sketch explain the working of a deep bar cage rotor induction motor. **(05 Marks)**

b. Draw and explain equivalent circuit and torque slip characteristic of a double cage induction motor. **(06 Marks)**

c. Explain the stand alone operation of the induction generator. **(05 Marks)**

Module-4

7 a. Why starter is necessary for an induction motor? With a neat diagram, explain the operation of a direct on line starter. **(08 Marks)**

b. Explain any two speed control methods of three phase induction motor. **(08 Marks)**

OR

8 a. Why single phase induction motor is not self starting? Explain the principle of operation of single phase induction motor using double revolving field theory. **(08 Marks)**

b. With a neat diagram, explain the construction and working principle of split phase induction motor. **(08 Marks)**

Module-5

9 a. Briefly explain V and inverted v curves of synchronous motor. **(06 Marks)**

b. Explain how synchronous motor acts as a synchronous condenser. **(05 Marks)**

c. Explain hunting in a synchronous motor. **(05 Marks)**

OR

10 a. Explain the construction working, characteristics and application of ac servomotor. **(08 Marks)**

b. Explain the principle of operation of a linear induction motor. Draw its characteristics. State its important applications. **(08 Marks)**

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15EE45

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electromagnetic Field Theory

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is a unit vector? Illustrate its significance in the vector representation. **(02 Marks)**

b. Explain Cartesian coordinate system and differential elements in Cartesian coordinate system. **(04 Marks)**

c. Define:
i) Dot product and cross product of two vectors.
ii) Gradient of a scalar field
iii) Divergence and curl of a vector field. **(10 Marks)**

OR

2 a. State and explain Coulomb's law of force between the two point charges. **(05 Marks)**

b. A point charge Q = 30nc is located at the origin in Cartesian co-ordinates. Find the electric flux density $\overline{D}$ at (1, 3, -4) m. **(05 Marks)**

c. State and explain Gauss law in electrostatics. **(06 Marks)**

Module-2

3 a. Derive an expression for energy expanded in making a point charge in an electric field. **(08 Marks)**

b. Derive an expression for the electric intensity at any point in the negative of the potential gradient at that point or $E = -\nabla V$. **(08 Marks)**

OR

4 a. With necessary relations, define current and current density. **(03 Marks)**

b. Explain the boundary conditions for a boundary between two di-electric materials. **(08 Marks)**

c. A capacitor consists of two metal plates each 100cm^2 placed parallel and 2mm apart. The whole of space between the plates is filled with a di-electric having a relative permittivity of 3.5. A potential difference of 500V is maintained between the plates. Calculate:
i) The capacitance
ii) The charge on capacitor
iii) Electric flux density
iv) Potential gradient. **(05 Marks)**

Module-3

5 a. Derive Poisson's and Laplace equations starting from point form of Gauss law. **(06 Marks)**

b. Verify that the potential field given below satisfies the Laplace's equation $V = 2x^2 - 3y^2 + z^2$ **(02 Marks)**

c. State and prove Unigueness theorem. **(08 Marks)**

OR

6 a. State and explain Biot-Savart's law. **(06 Marks)**

b. State and explain Stoke's theorem. **(04 Marks)**

c. Derive an expression for vector magnetic potential. **(06 Marks)**

Module-4

7 a. Derive an expression for the force between differential current elements. **(08 Marks)**

b. A point chart of Q = -1.2C has velocity $\bar{v} = (5\bar{a}x + 2\bar{a}y - 3\bar{a}z)m/s$. Find the magnitude of the force exerted on the charge if,

i) $\bar{E} = -18\bar{a}x + 5\bar{a}y - 10\bar{a}z \ v/m$

ii) $\bar{B} = -4\bar{a}x + 4\bar{a}y + 3\bar{a}z \ T$

iii) Both are present simultaneously **(08 Marks)**

OR

8 a. Derive the boundary conditions at the interface between two magnetic materials of different permeabilities. **(08 Marks)**

b. Calculate the inductance of a solenoid of 200 turns wound tightly on a cylindrical tube of 6cm diameter. The length of the tube is 60cm and the solenoid is in air. **(02 Marks)**

c. Define mutual inductance. Derive an expression for mutual inductance of two different coils. **(06 Marks)**

Module-5

9 a. Explain briefly Faraday's law and displacement current for time varying fields. **(07 Marks)**

b. In a given lossy dielectric medium conduction current density $J_c = 0.02Sin10^9 t(A/m^2)$. Find the displacement current density if $\sigma = 10^3$ s/m and $\varepsilon_r = 6.5$. **(03 Marks)**

c. Write Maxwell's equations in point form and in integral form for time varying fields. **(06 Marks)**

OR

10 a. Discuss the propagation of uniform plane waves in a lossless medium. **(06 Marks)**

b. Define poynting vector and explain the power flow associated with it. **(06 Marks)**

c. A 300MHz uniform plane wave propagates through fresh water for which $\sigma = 0$, $\mu_r = 1$ and $\epsilon_r = 78$. Calculate:

i) The attenuation constant

ii) The phase constant

iii) The wave length. **(04 Marks)**

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15EE46

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Operational Amplifiers and Linear ICs

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the following terms:
(i) CMRR (ii) Slew Rate **(06 Marks)**

b. For inverting amplifier obtain exact and approximate expression for gain A_f. Why inverting mode is preferred when compared with non-inverting mode? **(06 Marks)**

c. State ideal characteristics of opamp. **(04 Marks)**

OR

2 a. Explain the working of non-inverting ac amplifier and derive an expression for lower cut off frequency f_L and $\left(\frac{V_0}{V_{in}}\right)$ **(08 Marks)**

b. Consider adder circuit with 3 inputs V_a, V_b and V_c. Assume inverting mode. Show that this circuit can be used as summing amplifier, averaging amplifier and scaling amplifier. **(08 Marks)**

Module-2

3 a. For I order low pass filter, derive an expression for $\left|\frac{V_o}{V_{in}}\right|$ and expression for frequency scaling. Assume non-inverting mode. **(08 Marks)**

b. Design a wide bandpass filter for F_L = 200 Hz, f_H = 1 kHz, passband gain = 4. Assume C = 0.01 μF for CPF and 0.05 μF for HPF. Calculate Q-factor also. Draw the circuit diagram. **(04 Marks)**

c. Explain the working of notch filter. **(04 Marks)**

OR

4 a. Compare shunt regulator and series regulator circuits. **(05 Marks)**

b. Explain the working of voltage follower regulator using opamp. **(07 Marks)**

c. Explain connection diagram of LM317 voltage regulator. **(04 Marks)**

Module-3

5 a. Obtain an expression for frequency of oscillation in Wein bridge oscillator using opamp and expression for minimum gain. **(08 Marks)**

b. Explain working of square wave generator using opamp and state expression for frequency of oscillation. **(08 Marks)**

OR

6 a. Explain zero crossing detector and what are its drawback? **(06 Marks)**

b. Explain working of voltage to current converter with grounded load. **(05 Marks)**

c. Consider Schmitt trigger in inverting mode. R_1 = 100 Ω, R_2 = 56 kΩ . V_{in} = 1 V, peak to peak sine wave, V_{cc} = ±15V. calculate V_{ut} and V_{lt}. Draw the circuit diagram and waveform. **(05 Marks)**

Module-4

7 a. Explain working of precision free wave rectifier. Obtain expression for V_o in positive and negative half cycles. **(08 Marks)**

b. Explain the working of peak detector. Draw the circuit diagram and different waveforms. **(08 Marks)**

OR

8 a. For digital to analog converted explain resolution, accuracy, monotonocity and conversion time. **(08 Marks)**

b. Explain working of counter type ADC. Draw its block diagram and timing diagram. State its drawback. **(08 Marks)**

Module-5

9 a. Explain the internal architecture of IC 555 timer. Draw its block diagram and pin diagram also. **(10 Marks)**

b. Design 555 timer based square wave generator to produce a symmetrical square wave of 1 kHz. V_{cc} = 12 V, draw the circuit diagram and draw the waveforms of V_c and V_o. Assume C = 0.1 μF. **(06 Marks)**

OR

10 a. Explain the operating principle of PLL. Draw the block diagram. **(06 Marks)**

b. Explain the application of PLL as frequency multiplier. **(05 Marks)**

c. Consider PLL IC 565 circuit diagram. R_1 = 10 kΩ, C_1 = 0.01 μF, V_{cc} = +/– 10V, calculate free running frequency, lock range and capture range and output range. Draw the circuit diagram. **(05 Marks)**

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17EE42

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power Generation and Economics

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Missing data, if any, may be suitably assumed.*

Module-1

1 a. Explain with neat sketch the working of medium head power plant. **(08 Marks)**
b. Discuss the factors considered for selection of site for hydro electric power plant. **(06 Marks)**
c. What is meant by water hammer with a neat sketch? Explain the function of surge tank. **(06 Marks)**

OR

2 a. With a neat sketch, explain the function of governor used to control the speed of hydraulic turbine. **(08 Marks)**
b. Define: (i) Hydrograph (ii) Flow duration curve and mass curve. **(06 Marks)**
c. Explain mini and micro hydel power plants briefly. **(06 Marks)**

Module-2

3 a. Explain the working of steam power plant with neat schematic diagram. **(08 Marks)**
b. Explain any three methods used for the disposal of ash in steam power plant. **(06 Marks)**
c. Explain the function of air-preheater and economizer in thermal power plant. **(06 Marks)**

OR

4 a. With neat sketch explain the working of a gas turbine power plant. **(08 Marks)**
b. Give the comparison of gas power plant with steam and diesel power plant. **(06 Marks)**
c. Explain the layout of a typical diesel electric power plant with a diagram. **(06 Marks)**

Module-3

5 a. Explain the function of the following in a Nuclear reactor:
(i) Control rod
(ii) Moderator
(iii) Reflector
(iv) Biological shield
(v) Cladding and structure materials
(vi) Coolant **(06 Marks)**
b. Write a brief note on safety measured to be taken while disposing the nuclear waste material. Also explain the various methods of nuclear waste disposal. **(06 Marks)**
c. Draw a neat diagram of pressurized water reactor and explain its advantages and disadvantages. **(08 Marks)**

OR

6 a. List out the advantages and disadvantages of nuclear power plant. **(06 Marks)**
b. What is 'nuclear reactor'? How are nuclear reactor classified? **(06 Marks)**
c. Give the construction and working of a 'Gas-cooled reactor'. What are its advantages and disadvantages? **(08 Marks)**

Module-4

7 a. Explain resonant grounding with a neat diagram and also list the advantages and disadvantages. **(08 Marks)**

b. Draw a neat single diagram of substation and explain it. **(06 Marks)**

c. Define a bus bar. Explain briefly a typical bus bar arrangement scheme. **(06 Marks)**

OR

8 a. What are the different methods of neutral earthing? Explain any one method in detail. **(08 Marks)**

b. Draw the line diagram of 66/11 KV substation. **(06 Marks)**

c. Write the specifications required for earthing as per I.S.I. **(06 Marks)**

Module-5

9 a. Explain:

(i) Two part tariff

(ii) Power factor tariff

(iii) Maximum demand tariff **(06 Marks)**

b. Discuss various methods of power factor improvement. **(06 Marks)**

c. A generating station has the following daily load cycle:

Time (hours)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	40	50	60	50	70	40

Draw the load curve and load duration curve and find :

(i) Maximum demand

(ii) Units generated per day

(iii) Average load

(iv) Load factor **(08 Marks)**

OR

10 a. Define the following terms applied to power system:

(i) Load factor

(ii) Demand factor

(iii) Plant capacity factor **(06 Marks)**

b. What are the objectives and requirements of tariff? **(06 Marks)**

c. A generating station has a maximum demand of 30 MW, a load factor of 0.6, a plant capacity of 0.48, and a plant use factor of 0.82. Find:

(i) The daily energy produced.

(ii) The reserve capacity of the plant.

(iii) The maximum energy that could be produced if the plant were running all the time.

(iv) The maximum energy that could be produced daily, if the plant when running according to operating schedule were fully loaded. **(08 Marks)**

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CBCS SCHEME

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17EE43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Transmission and Distribution

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the advantages of high voltage transmission with suitable expressions. **(08 Marks)**

b. A transmission line has a span of 150 m between level supports. The conductor has a cross sectional area of 2 cm^2. The tension in the conductor is 2000 kg. If the specific gravity of the conductor materials is 9.9 gm/cm^3 and wind pressure is 1.5 kg/m length, calculate the sag. What is the vertical sag? **(12 Marks)**

OR

2 a. Define: (i) ACSR (ii) GTACSR (iii) String efficiency (iv) Vibration damper **(08 Marks)**

b. Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 KV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $1/8^{th}$ of the capacitance of the insulator itself. Also find the string efficiency. **(12 Marks)**

Module-2

3 a. Derive an expression for the inductance of a conductor due to internal and external flux. **(12 Marks)**

b. The three conductors of a 3 phase line are arranged at the corners of a triangle of side 2m, 2.5 m and 4.5 m, Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24 cm. [Refer Fig.Q3(b)]

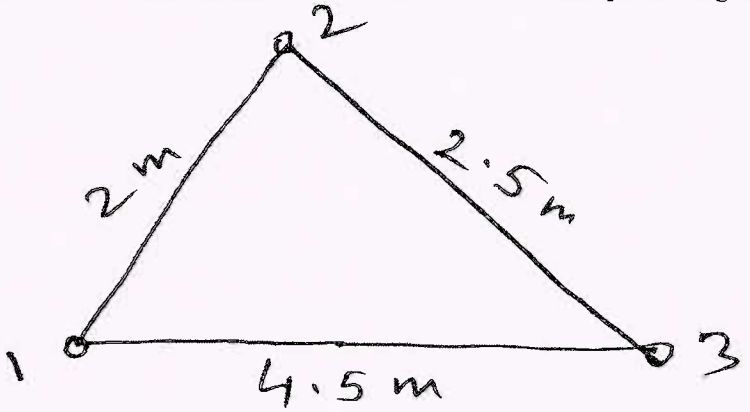

Fig.Q3(b) **(08 Marks)**

OR

4 a. Derive the expression for line to neutral capacitance for a 3 phase overhead line when the conductors are symmetrically spaced. **(12 Marks)**

b. A single phase transmission line has two parallel conductors 3 metre apart, radius of each conductor being 1 cm. Calculate the capacitance of the line per km. Given that $\in_0 = 8.854 \times 10^{-12}$ F/m. **(08 Marks)**

Module-3

5 a. Explain the nominal π method for obtaining the performance calculation of medium transmission line. Draw the corresponding vector diagram. **(10 Marks)**

b. A short 3ϕ transmission line with an impedance of (6 + J8) Ω per phase has sending and receiving end voltages of 120 KV and 110 KV respectively for some receiving end load at a p.f. of 0.9 lagging. Determine:
(i) Power output
(ii) Sending end power factor. **(10 Marks)**

OR

6 a. Develop the generalized circuit constants for:
(i) Short transmission line
(ii) Medium line using nominal T method. **(10 Marks)**

b. Differentiate different types of overhead transmission line. **(06 Marks)**

c. Write a short note on Ferranti effect. **(04 Marks)**

Module-4

7 a. Define corona. What are the factors which affect corona? **(06 Marks)**

b. Explain with reference to corona:
(i) Critical descriptive voltage
(ii) Visual critical voltage **(08 Marks)**

c. Explain methods of reducing corona effect in an overhead transmission line. **(06 Marks)**

OR

8 a. Define grading of cables. Explain inter sheath grading of cable. **(08 Marks)**

b. Derive an expression for the insulation resistance of a single core cable. **(08 Marks)**

c. Write the comparison between ac and dc cable. **(04 Marks)**

Module-5

9 a. Explain Radial and Ring main distributor. **(08 Marks)**

b. A 2 wire dc distributor 200 metres long is uniformly loaded with 2 A/metre. Resistance of single wire is 0.3 Ω/km. If the distributor is fed at one end. Calculate:
(i) The voltage drop upto a distance of 150 m from feeding point
(ii) The maximum voltage drop. **(12 Marks)**

OR

10 a. Define:
(i) Reliability
(ii) Power quality
(iii) Reliability aids **(08 Marks)**

b. Explain the requirements of good distribution system. **(08 Marks)**

c. Explain the effect of disconnection of neutral in a 3 phase 4 wire systems. **(04 Marks)**

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17EE44

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electric Motors

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Derive the torque equation of a DC motor. **(05 Marks)**

b. What are the limitation of speed control of a dc shunt motor by armature control method? Name and explain the method of overcoming these limitations. **(08 Marks)**

c. A 200V shunt motor has armature resistance of 0.1Ω and shunt field resistance of 240Ω. Its rotational losses are 236W. On full load the line current is 9.8A with the motor running at 1450rpm. Determine

i) Mechanical power developed
ii) Power output
iii) Load torque
iv) Full load efficiency. **(07 Marks)**

OR

2 a. What is Back emf? Explain its significance in DC motor operation. **(04 Marks)**

b. What is the necessity of starter? Explain with a neat diagram, the operation of a 3-point starter. **(10 Marks)**

c. A 230V, DC shunt motor runs at 800rpm and takes armature current of 50A.Find the resistance to be added to the field circuit to increase speed from 800rpm to 1000rpm at an armature current of 80A. Assume flux is proportional to field current, Armature resistance is 0.15Ω and field resistance is 250Ω. **(06 Marks)**

Module-2

3 a. Explain with a neat diagram, field test of two DC series motors to determine the efficiency of the machines. **(06 Marks)**

b. Hopkinson's test is conducted on two DC shunt machines. The supply current is 15A at 200V. The generator output current is 85A. The field current of motor and generator are2.5A and 3A respectively. The armature resistance of each machine is 0.05Ω. Find the efficiency of each machine on load. **(08 Marks)**

c. Derive torque equation of a 3ϕ induction motor and hence obtain the condition for maximum running torque. **(06 Marks)**

OR

4 a. With a net diagram, explain retardation test by elimination method to determine the stray losses and its separation into core losses and rotational losses. **(08 Marks)**

b. The field test on two mechanically coupled DC series motors with their fields connected in series and one machine running as motor while the other running as generator gave the following data :
Motor : armature current 40A, armature voltage 200V, voltage drop across fields 15V
Generator : Armature current 32A, armature voltage 160V, voltage drop across field 15V
Armature resistance is 0.4Ω, calculate the efficiency of each machine. **(06 Marks)**

c. Develop torque slip characteristics of a 3ϕ induction motor when slip varies between zero and 2. **(06 Marks)**

Module-3

5 a. Develop the phasor diagram of a 3ϕ induction motor on load. **(06 Marks)**

b. List out the disadvantages of squirrel cage Induction motor. Explain with a neat diagram, the construction and operation of a double case induction motor. **(10 Marks)**

c. Show that the locus of rotor current is a semicircle through appropriate equations. **(04 Marks)**

OR

6 a. A 415V, 29.84kW, 50Hz delta connected motor gave following test data :

No load : 415V, 21A, 1250W

Blocked rotor test : 100V, 45A, 2730W

Construct the circle diagram and hence determine :

i) Line current and power factor at full load

ii) Maximum torque

Assume stator and rotor copper losses are equal at standstill. **(12 Marks)**

b. Obtain the phasor diagram and hence the locus of stator current of an Induction generator. **(04 Marks)**

c. List out the merits of Induction Generator. **(04 Marks)**

Module-4

7 a. Justify the need for a starter to start a 3ϕ induction motor. Explain with a neat diagram, the operation of a star delta starter. **(12 Marks)**

b. Explain the construction and operation of shaded pole single phase induction motor. List out its applications. **(08 Marks)**

OR

8 a. What are the limitations of speed control by stator voltage control? **(02 Marks)**

b. Explain why single phase induction motors are not self starting using double field revolving theory. **(08 Marks)**

c. Explain the construction and operation of capacitor start and run 1ϕ Induction motor. **(10 Marks)**

Module-5

9 a. Explain the principle of operation of synchronous motor. **(08 Marks)**

b. Explain with a neat diagram, the construction and operation of linear induction motor and state its application. **(12 Marks)**

OR

10 a. Explain how a synchronous motor can be operated as a synchronous condenser with change in excitation. **(08 Marks)**

b. With a neat diagram, explain the construction and operation of stepper motor. **(12 Marks)**

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17EE45

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electromagnetic Field Theory

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Given the two co-planar vectors $\bar{A} = 3\bar{a}_x + 4\bar{a}_y - 5\bar{a}_z$ and $\bar{B} = -6\bar{a}_x + 2\bar{a}_y + 4\bar{a}_z$, obtain:
(i) Cross product of $\bar{A}$ and $\bar{B}$
(ii) Unit vector normal to the plane containing the vectors $\bar{A}$ and $\bar{B}$ **(08 Marks)**

b. Write down the relationships between the Cartesian and spherical system. **(06 Marks)**

c. Derive the relation between electric fluid ($\bar{E}$) intensity and electric flux density ($\bar{D}$). **(06 Marks)**

OR

2 a. Derive an expression for the electric field intensity ($\bar{E}$) due to infinite line charge. **(10 Marks)**

b. Find the electric field intensity ($\bar{E}$) at origin if the following charge distributions are present in free space.
(i) Point charge 12 ηc at P(2, 0, 6)
(ii) Uniform line charge of line charge density 3 ηc/m at x = 2, y = 3
(iii) Uniform surface charge of density 0.2 ηc/m^2 at x = 2. **(10 Marks)**

Module-2

3 a. An electric potential is given by $V = \frac{60\sin\theta}{r^2}$ v, find V and $\bar{E}$ at P(3, 60°, 25°). **(08 Marks)**

b. Derive the expression for potential difference due to infinite line of charge. **(06 Marks)**

c. Determine work done in carrying a charge of –2C from (2, 1, –1) to (8, 2, –1) in the electric field $\bar{E} = y\bar{a}_x + x\bar{a}_y$ V/m in Cartesian coordinates considering the path along the parabola $x = 2y^2$. **(06 Marks)**

OR

4 a. Obtain the boundary conditions between two perfect dielectric materials. **(08 Marks)**

b. The electric field intensity in polystyrene ($\epsilon_r = 2.55$) filling the space between the plates of a parallel plate capacitor is 10 KV/m. The distance between the plates is 1.5 mm. Calculate:
(i) The surface charge density of free charge on the plates.
(ii) The potential difference between the plates. **(06 Marks)**

c. State the properties of conductor. **(06 Marks)**

Module-3

5 a. State and explain Uniqueness theorem. **(06 Marks)**

b. Conducting spherical shells with radii a = 10 cm and b = 30 cm are maintained at a potential difference of 100 V such that V(r = b) = 0 and V(r = a) = 100 V. Determine V and E in the region between the shells of $\epsilon_r = 2.5$ in the region, determine the total charge induced on the shells. **(10 Marks)**

c. Determine whether or not the following potential fields satisfy the Laplace's equation $V = r\cos\phi + z$. **(04 Marks)**

OR

6 a. State and prove Ampere's circuital law. **(08 Marks)**

b. If a particular field is given by, $\bar{F} = (x + 2y + az)\bar{a}_x + (bx - 3y - z)\bar{a}_y + (4x + cy + 2z)\bar{a}_z$ then find the constants a, b and c such that the field is irrotational. **(04 Marks)**

c. Given $\bar{H} = 20r^2 \bar{a}_\phi$ A/m,

(i) Determine the current density $\bar{J}$.

(ii) Also determine the total current that crosses the surface r – 1 m, $0 \le \phi < 2\pi$ and z = 0 (in cylindrical coordinates). **(08 Marks)**

Module-4

7 a. Derive the expression for the force on a differential current element placed in a magnetic field. **(06 Marks)**

b. Find the force per meter length between two long parallel wires separated by 10 cm in air and carrying a current of 10 A in the same direction. **(06 Marks)**

c. A solenoid with $N_1 = 1000$, $l_1 = 50$ cm and $r_1 = 1$ cm is concentric within a second coil of $N_2 = 2000$, $r_2 = 2$ cm and $l_2 = 50$ cm. Find the mutual inductance assuming free-space conditions. **(08 Marks)**

OR

8 a. With a neat sketch, obtain the expression for inductance of toroid. **(08 Marks)**

b. Calculate the inductance of a solenoid of 200 turns wound tightly on a cylindrical tube of length 60 cm and of diameter 6 cm, given that medium is air. Derive the expression used. **(08 Marks)**

c. Define: (i) Magnetization (ii) Permeability **(04 Marks)**

Module-5

9 a. Given $\bar{E} = E_m \sin(\omega t - \beta z)\bar{a}_y$ in free space, find $\bar{D}$, $\bar{B}$ and $\bar{H}$. **(08 Marks)**

b. Obtain the solution of wave equation for uniform plane wave in free space. **(08 Marks)**

c. The depth of penetration in a certain conducting medium is 0.1 m and the frequency of the electromagnetic wave is 1 MHz. find the conductivity of the conducting medium. **(04 Marks)**

OR

10 a. Derive the expression for integral form and point form of Faraday's law. **(07 Marks)**

b. Wet marshy soil is characterized by $\sigma = 10^{-2}$ s/m, $\epsilon_r = 15$ and $\mu_r = 1$. At frequencies 60 Hz, 1 MHz, 100 MHz and 10 GHz, indicate whether soil be considered as conductor or dielectric. **(08 Marks)**

c. Write a short note on skin effect in conductors. **(05 Marks)**

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17EE46

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Operational Amplifier and Linear IC's

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the general stages of op-amps with a neat block diagram. **(10 Marks)**

b. Explain the working inverting and non-inverting amplifier using op-amp. **(10 Marks)**

OR

2 a. Explain with a neat diagram inverting and non-inverting summing amplifiers. **(12 Marks)**

b. Design the instrumentation amplifier with maximum input bias current 750 nA. The circuit is to produce an output ranging from 4V to 8V when the input is 10 mV to 20 mV. **(08 Marks)**

Module-2

3 a. Derive the gain equation for second order high pass Butterworth filter. **(10 Marks)**

b. Design a Butterworth second order high pass filter circuit, to have a cut-off frequency of 6 kHz. Calculate the actual cutoff frequency for the circuit using the selected component values. **(10 Marks)**

OR

4 a. Explain the following working parameter of voltage regulator with a neat diagram:
(i) Regulator action (ii) Source effect
(iii) Load effect (iv) Ripple rejection **(08 Marks)**

b. Draw and explain the working of adjustable output regulator and design the voltage regulator circuit to produce a 12 V output with a 50 nA maximum load current. **(12 Marks)**

Module-3

5 a. With a neat diagram, explain the action of RC phase shift oscillator. Write advantages and disadvantages of RC phase shift oscillator (IC 741). **(12 Marks)**

b. Determine the UTP and LTP of Schmitt trigger circuit using op-amp. Assume that the op-amp is rail-to rail operated and the diode forward voltage drop is 0.7V and draw its input and output waveforms. **(08 Marks)**

OR

6 a. With a neat diagram, explain :
(i) Comparator as zero crossing detector
(ii) Voltage to current convector with grounded load. **(10 Marks)**

b. With a neat circuit diagram, explain current to voltage converter and design the current amplifier to have a gain of 10. The maximum input current is 1 mA, R_L = 100 Ω and V_{CC} = 15 V. **(10 Marks)**

Module-4

7 a. Explain the working of precision full wave rectifier with necessary circuit diagram and write difference between ordinary rectifier and precision rectifier. **(10 Marks)**

b. With neat circuit, explain linear Ramp ADC with necessary input and output waveforms. **(10 Marks)**

OR

8 a. Design a precision full wave rectifier circuit to produce a 2V peak output from a sine wave input with a 0.5 V_p value and 1 MHz frequency. [$V_{CC} = \pm 15V$. Assume $I_1 = 500\ \mu A$] **(08 Marks)**

b. Draw and explain working of integrated circuit 8 bit DAC. **(08 Marks)**

c. Calculate the analog output voltage (DAC) when the input is $V_{ref} = 10$ V and $R = R_F = 5\ K\Omega$.
(i) 00001 (ii) 10000 (iii) 11111 **(04 Marks)**

Module-5

9 a. Draw the basic block diagram PLL and explain each components with necessary waveforms. **(08 Marks)**

b. Draw and explain circuit diagram of Astable multivibrator using 555 Timer and design the Astable multivibrator to have a ±9V, 1 kHz output. **(12 Marks)**

OR

10 a. Explain PLL IC565 application as frequency multiplier and frequency synthesizer. **(10 Marks)**

b. Draw and explain working of Monostable multivibrator using 555 Timer and draw its input and output waveforms. **(10 Marks)**

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18EE32

Third Semester B.E. Degree Examination, Aug./Sept.2020
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Determine voltage V_3 for the circuit shown in Fig.Q1(a), using Mesh analysis method.

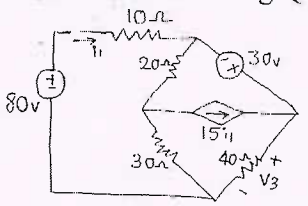


Fig.Q1(a) **(08 Marks)**

b. Apply node analysis method to find node voltages V1, V2, V3 for the circuit shown in Fig.Q1(b).

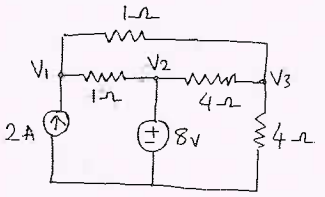


Fig.Q1(b) **(07 Marks)**

c. Determine the equivalent resistance between the terminals AB for circuit shown in Fig.Q1(c).

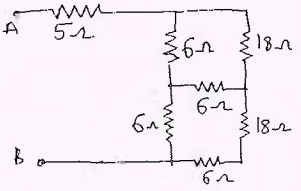


Fig.Q1(c) **(05 Marks)**

OR

2 a. Apply loop analysis method to find voltage V, such that current through (2 + j3) Ω resistor is zero. For the circuit shown in Fig.Q2(a).

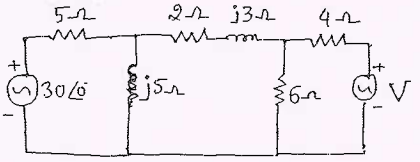


Fig.Q2(a) **(07 Marks)**

b. Determine the voltage V_X in the circuit shown in Fig.Q2(b) using Nodal analysis method.

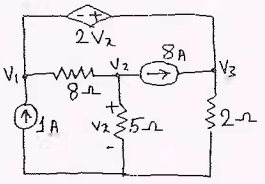


Fig.Q2(b) **(07 Marks)**

c. Apply source transformation and shifting method to reduce the circuit shown in Fig.Q2(c) to a single voltage source in series with resistance.

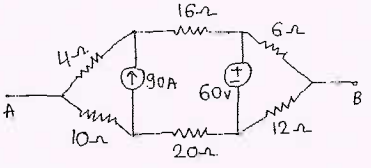


Fig.Q2(c) **(06 Marks)**

Module-2

3 a. In the circuit shown in Fig.Q3(a), determine current I_X using super position theorem.

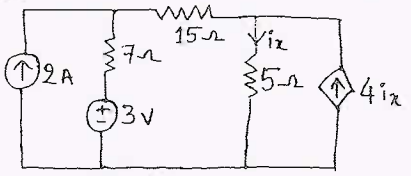


Fig.Q3(a) **(07 Marks)**

b. Determine Thevenin's equivalent of the circuit in Fig.Q3(b).

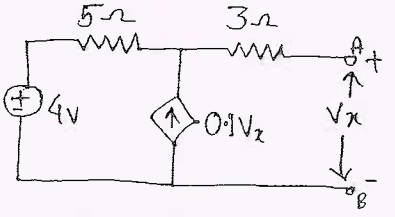


Fig.Q3(b) **(07 Marks)**

c. Use Millman's theorem to find current I, for the circuit shown in Fig.Q3(c).

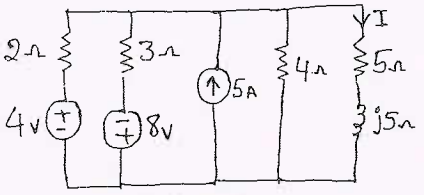


Fig.Q3(c) **(06 Marks)**

OR

4 a. Determine current thorough 1Ω resistor. Using Nortan's theorem for the circuit shown in Fig.Q4(a).

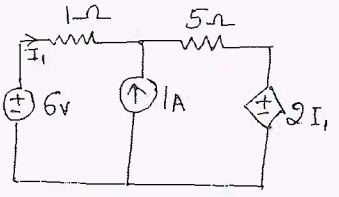


Fig.Q4(a) **(07 Marks)**

b. Determine the load resistance R_L to receive maximum power from the source. Also find maximum power delivered to the load in the circuit shown in Fig.Q4(b).

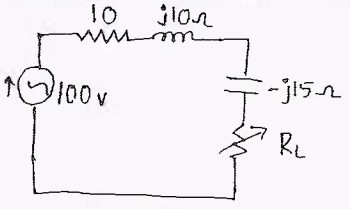


Fig.Q4(b) **(07 Marks)**

c. State and verify reciprocity theorem for the circuit shown in Fig.Q4(c).

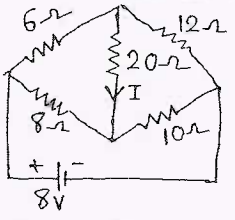


Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Derive an expression for the resonance frequency of a resonant circuit consisting of R_L, XL in parallel with RC, XC. **(07 Marks)**

b. An impedance coil having a resistance of 4Ω and an inductance of 1mH connected in series with 10μF capacitor. Determine resonant frequency, impedance at resonance, half power frequencies, Q of the circuit and bandwidth. **(08 Marks)**

c. For the circuit shown in Fig.Q5(C), the switch is moved from position 1 to 2 at t = 0. The steady state has been reached before switching. Determine : i, $\frac{di}{dt}, \frac{d^2i}{dt^2}$ at $t = 0^+$.

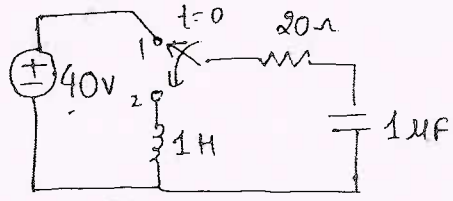


Fig.Q5(c) **(05 Marks)**

OR

6 a. In circuit shown in Fig.Q6(a), the switch K is closed at t = 0. Calculate $\frac{di_1(0^+)}{dt}$ and $\frac{di_2(0^+)}{dt}$. Assume that the circuit was not activated before t = 0.

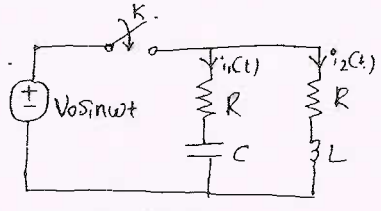


Fig.Q6(a) **(10 Marks)**

b. Determine R_L and R_C for which the circuit shown in Fig.Q6(b), resonances at all frequencies.

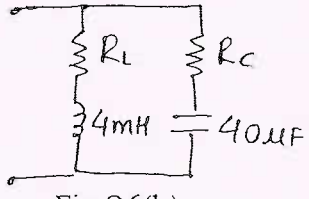


Fig.Q6(b) **(04 Marks)**

c Show that in series RLC circuit, the resonant frequency $f_0 = \sqrt{f_1 f_2}$. **(06 Marks)**

Module-4

7 a. State and prove initial and final value theorem in Lapalce transformation. **(08 Marks)**

b. Find Lapalce transform of the signal shown in Fig.Q7(b).

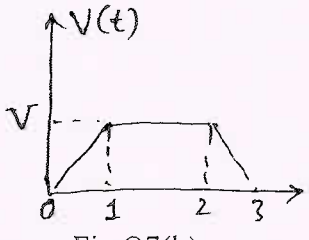


Fig.Q7(b) **(08 Marks)**

c. Find Laplace transform of unit step function. **(04 Marks)**

OR

8 a. State and prove shifting theorem. **(05 Marks)**

b. Verify initial value theorem, given $f(t) = 10e^{5t}$. **(05 Marks)**

c. Find Laplace transform of the signal in Fig.Q8(c).

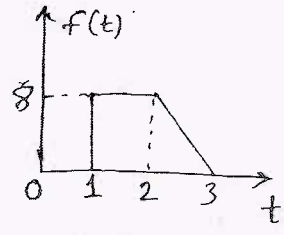
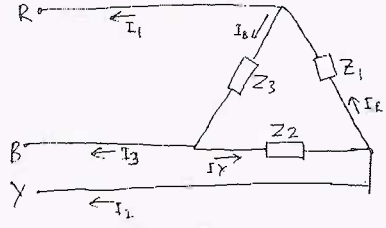


Fig.Q8(c) **(10 Marks)**

Module-5

9 a. Three impedances $Z_1 = 20\angle 30°\Omega$, $Z_2 = 40\angle 60°\Omega$ and $Z_3 = 10\angle -90°\Omega$ are delta connected to a 400V, 3 – phase system as show in Fig.Q9(a). Determine the :
i) Phase currents ii) Line currents.



FigQ9(a) **(06 Marks)**

b. Determine Y–parameters for the circuit shown in Fig.Q9(b).

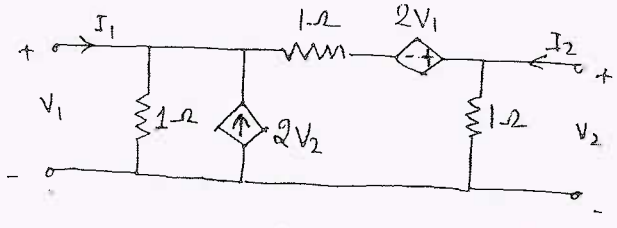


Fig.9(b) **(08 Marks)**

c. Express Y–parameters interms of Z–parameters. **(06 Marks)**

OR

10 a. An unbalanced four-wire, star connected load has a balanced voltage of 400V, the loads are $Z_1 = (4 + j8)\Omega$, $Z_2 = (3 + j4)\Omega$, $Z_3 = (15 + j20)\Omega$.
Calculate the : i) line currents ii) current in the neutral wire. **(06 Marks)**

b. Find Z-parameters and T-parameters for the circuit shown in Fig.Q10(b).

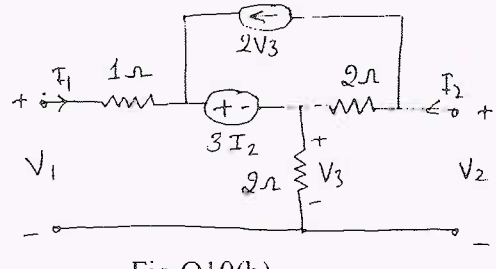


Fig.Q10(b) **(10 Marks)**

c. Define H – parameters with necessary equations. **(04 Marks)**

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CBCS SCHEME

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18EE33

Third Semester B.E. Degree Examination, Aug./Sept.2020
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With neat sketch, explain the open circuit and short circuit tests conducted on a single phase transformer to find efficiency at any load and to determine equivalent circuit parameters. **(08 Marks)**

b. Explain the operation of a single phase transformer with phasor diagram for lagging power factor load. **(06 Marks)**

c. Find the all day efficiency of 500 KVA distribution transformer whose copper loss and iron loss at full load are 4.5 KW and 3.5 KW respectively. During a day it is loaded as below:

Number of hours	6	10	4	4
Loading in KW	400	300	100	0
Power factor	0.8	0.75	0.8	-

(06 Marks)

OR

2 a. Explain with the help of connection and phasor diagram how SCOTT connections are used to obtain two phase from three phase mains. **(06 Marks)**

b. A 3 phase, 1000 KVA, 6600/1100 V transformer is delta connected on the primary and star connected on the secondary. The primary resistance per phase is 1.8 Ω and secondary resistance per phase is 0.025 Ω. Determine the efficiency when the secondary is supplying full load at 0.8 pf and the iron loss is 15 KW. **(08 Marks)**

c. Explain with neat circuit diagram and phasor diagram of Δ-Δ and open Δ type of transformer connections. **(06 Marks)**

Module-2

3 a. Derive an expression for the current shared by two transformers connected in parallel sharing a common load when no load voltage of both transformer are unequal. **(08 Marks)**

b. List out applications of autotransformer. Derive the expression for the saving of copper in an autotransformer compared to two winding transformer. **(08 Marks)**

c. Fig.Q3(c) shows an autotransformer used to supply a load of 2 kW at 230 V from a 400 V ac supply. Find the currents in parts AC and BC, neglecting losses and no load current. Assume resistive load. Also calculate the copper saving.

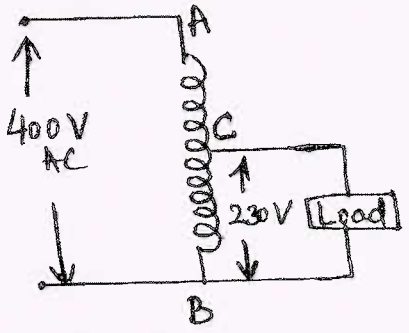

Fig.Q3(c) **(04 Marks)**

OR

4 a. Write short notes on tap-changing transformers. **(06 Marks)**

b. What is the necessity of parallel operation of two single phase transformers? List all the necessary conditions of parallel operation of 1ϕ transformers. **(06 Marks)**

c. The short circuit test results of two transformers A and B are as below. On open circuit, both transformers gave a secondary voltage of 2200 V. The primary terminals are connected in parallel and 11000 V are applied to the primary.

	I_{SC}	V_{SC}	W_{SC}
Transformer A	10A	200 V	1000 W
Transformer B	30A	200 V	1500 W

Calculate the individual transformer current and power when supplying a load of 200 A at 0.8 pf lagging. Neglect no load currents. **(08 Marks)**

Module-3

5 a. Explain the procedure in obtaining equivalent circuit of three winding transformer. Draw the circuit referred to primary wdg. **(06 Marks)**

b. Write short notes on cooling of transformers. **(06 Marks)**

c. Define armature reaction. With neat diagram, explain armature reaction in DC generator. **(08 Marks)**

OR

6 a. Explain the problems associated with communication in DC generator and discuss the methods to overcome commutation problems. **(06 Marks)**

b. Derive the expression for distribution factor applicable in synchronous generator. Write the emf equation with winding factors. **(06 Marks)**

c. A 3ϕ, 8 pole, star connected alternator has the armature coils short chorded by one slot. The coil span is 165° electrical. The alternator is driven at the speed of 750 rpm. If there are 12 conductors per slot and flux per pole is 50 mWb. Calculate the value of induced emf across the terminals. **(08 Marks)**

Module-4

7 a. Derive the expression for no load emf interms of terminal voltage, load current, armature resistance and synchronous reactance. Draw the vector diagram for lagging power factor load. **(06 Marks)**

b. Explain the method of voltage regulation of synchronous generator by EMF method. **(08 Marks)**

c. A 3ϕ Y connected alternator is rated at 1600 KVA, 13,500 volts. $R_a = 1.5\ \Omega$ and $X_s = 30\ \Omega$ per phase. Calculate the percentage regulation for a load of 1280 KW at a p.f. 0.8 lag and 0.8 lead. **(06 Marks)**

OR

8 a. The OC and SC test readings of a 3ϕ Y connected 1000 KVA, 2000 V, 50 Hz synchronous generator are

I_f Amps	10	20	25	30	40	50
OC line voltage	800	1500	1760	2000	2350	2600
SC current Amps	-	200	250	300	-	-

The armature resistance is 0.2 Ω/phase. Draw the characteristic curves and estimate the full load regulation at 0.8 pf lagging using Amper-Turn method. **(08 Marks)**

b. Explain ZPF method of voltage regulation of synchronous generator with all the circuit diagrams necessary in the test. **(12 Marks)**

Module-5

9 a. With neat circuit diagram, explain the method of determination of X_d and X_q of salient pole alternator. **(10 Marks)**

b. What are the conditions of synchronization of alternators? Explain the method of synchronization of alternators. **(10 Marks)**

OR

10 a. What is hunting in synchronous machines? Explain the role of damper winding. **(08 Marks)**

b. Write short notes on capabilities curves of synchronous generator. **(06 Marks)**

c. Write short notes on power angle characteristics of an alternator. **(06 Marks)**

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CBCS SCHEME

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18EE34

Third Semester B.E. Degree Examination, Aug./Sept.2020
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the working of series clipper to clip the input sinusoidal signal: (i) above V_R (ii) below V_R . Draw the input and output waveforms and transfer characteristic. Neglect cut in voltage V_r. Assume clipping action in positive half cycle of input signal. **(06 Marks)**

b. Define operating point in a transistor and explain its significance. **(04 Marks)**

c. Explain the dc analysis of emitter stabilized bias circuit, for this circuit if R_c = 1 kΩ, R_B = 220 kΩ, R_E = 1 kΩ, calculate I_B, I_C, I_E V_{CE} and V_B . Assume β = 200. **(10 Marks)**

OR

2 a. For collector to base bias circuit obtain expressions for stability factors S_{ICO} , S_{UBE} and S_β . **(10 Marks)**

b. Design a voltage divider bias circuit if V_{CC} = 12V, V_{CE} = 6V, V_E = 1V, I_C = 1 mA, S_{ICO}= 20, β = 100. Draw the circuit **(10 Marks)**

Module-2

3 a. Develop h-parameter model for transistor amplifier, hence draw h-parameter model for CB, CE and CC modes. **(10 Marks)**

b. For a single stage CE amplifier, R_s = 1 kΩ, R_1 = 50 kΩ, R_2 = 2 kΩ, R_c = 2 kΩ, R_L = 2 kΩ. h_{fe} = 50, h_{oe} = 25 μA/V , h_{ie} = 1.1 kΩ and $h_{re} = 2.5\times10^{-4}$. Calculate A_V, R_i, A_i, A_{IS} , A_{VS} and R_0. Draw the circuit diagram. Use approximate hybrid model. Across RE, bypass capacitor is used. **(10 Marks)**

OR

4 a. For common emitter amplifier with collector to base bias circuit, determine A_I, Z_i, A_V, A_{VS}, A_{IS} and Z'_0. Draw circuit diagram. R_B = 200 kΩ, R_c = 10 kΩ, h_{ie} = 1.1 kΩ, h_{fe} = 50. $h_{oe} = h_{re} = 0$ and R_s = 1 kΩ. **(10 Marks)**

b. For emitter voltage follower circuit, obtain expression for A_I , Z_i , A_V , R_0 and R_0'. Use approximate hybrid model. Also state features of emitter follower circuit. **(10 Marks)**

Module-3

5 a. For the Darlington connection, obtain expression for A_{I2} , R_{i2} for II stage and A_{I1} , R_{i1} for I stage. **(10 Marks)**

b. Consider a 2 stage RC coupled amplifier for the I stage R_S = 1 kΩ, R_{C1}=15 kΩ , R_{E1} = 100 Ω R_1 = 200 kΩ , R_2 = 20 kΩ. For II stage R_{C2} = 4 kΩ, R_{E2} = 330 Ω, biasing resistors R_3 = 47 kΩ, R_4 = 4.7 kΩ. Bypass capacitor is connected across R_{E1} and R_{E2}. Assume h_{ie} = 1.2 kΩ, h_{fe} = 50, h_{oe} = 25 μA/V, $h_{re} = 2.5\times10^{-4}$, Determine the overall A_V , A_{VS} , R_{01}' and R_{02}'. Draw the circuit diagram. **(10 Marks)**

OR

6 a. Explain the concept of voltage amplifier, current amplifier, transconductance amplifier and transresistance amplifier using Thevenin's or Norton's equivalent circuit. **(10 Marks)**

b. For voltage shunt feedback amplifier topology, obtain expressions for R_{if} and R_{of}. **(10 Marks)**

Module-4

7 a. Obtain an expression for 2nd harmonic distortion in a power amplifier using 3-point method. **(10 Marks)**

b. A class-B push pull amplifier supplies power to a resistive load of 12 Ω. The turns ratio of output transformer is 3:1 and η = 78.5%. Determine the maximum power output, maximum power dissipation in each transistor maximum base and collector current in each transistor. Assume V_{cc} = 20 V and h_{fe} = 25. **(10 Marks)**

OR

8 a. Obtain expression for f_0 and h_{fe} in Colpitt's RF oscillator. **(10 Marks)**

b. Compare RC phase shift and Wein bridge oscillator. **(05 Marks)**

c. Calculate the values of R and C in a RC phase shift oscillator if f_0 = 500 Hz. Draw the circuit diagram. Assume C = 0.1 μF. **(05 Marks)**

Module-5

9 a. Explain construction, operation and characteristics of enhancement MOSFET. **(10 Marks)**

b. Compare D-MOSFET and E-MOSFET. **(05 Marks)**

c. Define transconductance "g_m" in FET and Show that $g_m = g_{m_0}\left(1 - \frac{V_{GS}}{V_P}\right)$ **(05 Marks)**

OR

10 a. Consider voltage divider bias circuit of JFET. If R_D = 1.2 kΩ, R_S = 2 kΩ, R_1 = 20 kΩ, R_2 = 10 kΩ, V_{DD} = 12V, I_{DSS} = 12 mA, V_P = – 4V, calculate I_D, V_{GS}, V_G, V_{DS} and V_S. Draw the circuit diagram. **(10 Marks)**

b. Consider JFET in fixed bias mode. Derive expressions for Z_{in}, Z_0 and A_V. If R_G = 1 MΩ, r_d = 50 kΩ, g_m = 2 m℧, calculate Z_i, A_v and Z_0. Draw the circuit diagram R_D = 5.1 kΩ. **(10 Marks)**

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18EE35

Third Semester B.E. Degree Examination, Aug./Sept.2020
Digital System Design

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. With a basic block diagram, explain the combinational logic circuit. **(04 Marks)**

b. Convert the following in the proper canonical formula and write the decimal notation.

i) $R = f(x, y, z) = (x + y)(\bar{x} + z)$ into maxterm canonical formula

ii) $Z = f(a, b, c) = ab + \bar{b}c + ac$ into minterm canonical formula. **(08 Marks)**

c. Reduce the following expression using k map and implement using basic gates.

i) f(a, b, c, d) = Σm(0, 1, 2, 3, 8, 9)

ii) f(A, B, C, D) = πM(0, 1, 4, 5, 14, 15) + d(12, 13). **(08 Marks)**

OR

2 a. Find the minimal sum and minimal product expression for the function :

f(a, b, c, d) = Σm(4, 5, 12, 13, 14, 15) +d(10,11). **(06 Marks)**

b. Simplify using Quine Mc Cluskey method :

f(a, b, c, d) = Σm(0, 2, 8, 10). **(07 Marks)**

c. Simplify using k Map.

f(a, b, c, d, e) = Σm(0, 1, 2, 3, 4, 5, 16, 17, 18, 19, 24, 25) + d(26, 27). **(07 Marks)**

Module-2

3 a. Design a 3 inputs, a, b and c and output y combinational circuit which has an output equal to 1 when majority of its inputs equal to 1 and output is 0 otherwise. **(06 Marks)**

b. Design a full adder by constructing the truth table and simplify the output equations. **(06 Marks)**

c. Implement the function :

f(a, b, c, d) = Σm(4, 5, 7, 9, 11, 12, 13, 15)

using :

i) 8 : 1 MUX with a, b, c, as select lines

ii) 4 : 1 MUX with a, b as select lines. **(08 Marks)**

OR

4 a. What is a Comperator? Design a 2 bit magnitude comperator using logic gates. **(10 Marks)**

b. Implement the following multiple function using one 74LS138 and external gates.

$f_1(A, B, C) = \Sigma m(1, 3, 4, 6)$

$f_2(A, B, C) = \pi M(2, 3, 5, 7)$. **(06 Marks)**

c. Configure a 16 : 1 MUX using 4 : 1 MUX. **(04 Marks)**

Module-3

5 a. Explain the operation of Master – Slave JK flipflop with logic diagram, truth table, symbol and timing diagram. **(10Marks)**

b. Differentiate latches and flipflops. Derive the characteristic equation of SR flipflop, JK flipflop, T flipflop and D flipflop. **(10 Marks)**

OR

6 a. Explain the operation of a Gated SR Latch using NAND logic. **(08 Marks)**

b. Explain the working of a switch debouncer using SR Latch with wave forms. **(08 Marks)**

c. Convert a JK flipflop to T flipflop. **(04 Marks)**

Module-4

7 a. Differentiate synchronous and asynchronous counter. **(04 Marks)**

b. Design a Mod 10 ripple counter using JK flipflop. **(06 Marks)**

c. Draw the logic diagram of a 4 bit shift register with four D flipflop and four 4 : 1 MUX with mode select inputs S_1 and S_0. The resister operates as follows :

S_1	S_0	Register Operation
0	0	No change
0	1	Compliment
1	0	Clear to zero
1	1	Load parallel data

(10 Marks)

OR

8 a. Mention the four different modes of operation shift register. With a neat block diagram, explain the operation of a 4 bit ring counter and Johnson counter. **(10 Marks)**

b. Design a MOD6 synchronous upcounter using T flipflop. **(10 Marks)**

Module-5

9 a. With a neat block diagram, explain and distinguish between Moore and Mealy model in a sequential circuit analysis. **(10 Marks)**

b. Design a synchronous counter using JK flipflop to count the following sequence :
$7 \rightarrow 4 \rightarrow 3 \rightarrow 1 \rightarrow 6 \rightarrow 0 \rightarrow 7$. **(10 Marks)**

OR

10 a. What are the different types of RAM and ROM? Explain. **(10 Marks)**

b. Construct a sequential circuit by obtaining the state and excitation table for the given diagram using KJ flipflop.

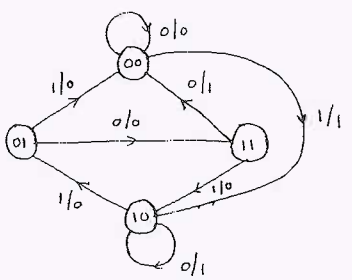

Fig.Q10(b) **(10 Marks)**

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18EE36

Third Semester B.E. Degree Examination, Aug./Sept.2020
Electrical and Electronic Measurements

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Obtain the expression for sensitivity of Wheatstone bridge. **(08 Marks)**

b. Explain the construction and working of Megger. **(06 Marks)**

c. A very small resistance 100πΩ is measured using Kelvin's double bridge having following resistors. The standard resistor = 300.05μΩ inner ratio arms = 100.41Ω and 300Ω, outer ratio arms = 100.32Ω and 300Ω. The resistance of link = 800μΩ. Calculate the unknown resistance. **(06 Marks)**

OR

2 a. Explain with sketch and vector diagram Maxwell's inductance – capacitance bridge to find inductance and Q-factor of coil. **(08 Marks)**

b. Explain sources and detectors that are used in A.C and D.C bridges. **(06 Marks)**

c. An Anderson bridge consists of 4 and R_1 in arm AB, a variable resistance in arm BC, a fixed resistance of 800Ω each in arms CD and DA, a variable resistance in arm DE and fixed capacitor of 1.2μf in arm CE. A supply of frequency 1000Hz is connected across A and C. The detector is connected between B and E. The balance is obtained in the arm DE is 500Ω and resistance of 900Ω in arm BC calculate the value of the unknown inductance L_1 and resistance R_1. **(06 Marks)**

Module-2

3 a. Explain the types of errors and how to minimize errors in Wattmeters. **(08 Marks)**

b. Obtain the expression for reactive power and power-factor. **(06 Marks)**

c. A Wattmeter has a coil of 0.03Ω resistance and pressure coil of 6000Ω resistance. Calculate the percentage error if the Wattmeter is so connected that

I. The current coil is on load side.

II. The pressure coil is on load side.

i) If the load takes 20A at a voltage of 220V and 0.6 power factor in each case.

ii) What load current would give equal errors with the two connections? **(06 Marks)**

OR

4 a. Explain with neat sketch, calibration of single phase energymeter. **(08 Marks)**

b. Explain with neat sketch, construction and operation of power-factor meter. **(06 Marks)**

c. The meter constant of 230V, 20A single phase energymeter is 1800rev/kwh. The meter makes 200 revolutions in 120secs when tested at full-load at 0.8pf lag at the rated voltage. Determine the error in the meter reading. **(06 Marks)**

Module-3

5 a. A moving coil instrument gives a full scale deflection for a current of 25mA with a potential difference of 200mV across it. Calculate: i) Shunt required to use it as an ammeter to get a range of 0-200A ii) Multiplier required to use it as a voltmeter of range 0-500V. **(05 Marks)**

b. Obtain expression for transformation ratio 'R' and phase angle 'θ'. **(10 Marks)**

c. Differentiate between CT and PT. **(05 Marks)**

OR

6 a. Explain errors of CT and PT. **(04 Marks)**

b. Explain the method to measure flux using Ballistic galvanometer with a neat sketch. **(08 Marks)**

c. Explain Ewing's double-bar method to find magnetizing force. **(08 Marks)**

Module-4

7 a. Mention the advantages of digital instruments. **(04 Marks)**

b. Explain with neat sketch, true RMS reading voltmeter. **(08 Marks)**

c. Explain with neat sketch, working of integrating type digital voltmeter. **(08 Marks)**

OR

8 a. With neat sketch, explain successive approximation type digital voltmeter. **(08 Marks)**

b. Explain with neat sketch, how Q-meter can be used for high impedance measurement. **(08 Marks)**

c. A coil is tuned to resonance at 600kHz with a resonating capacitance of 40μμf. At 300kHz, the resonance is obtained with a resonating capacitance of 175μμf. Find the self capacitance of the coil and its inductance. **(04 Marks)**

Module-5

9 a. Explain seven segment display and Bargraph display. **(10 Marks)**

b. Explain LED and LCD display and also Nixic tube. **(10 Marks)**

OR

10 a. Explain strip-chart recorder and potentiometric recorder. **(10 Marks)**

b. Explain X-Y recorder and Electro Cardio Graph (ECG). **(10 Marks)**

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17EE32

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Distinguish between:i) Active and passive elements ii) Ideal and practical sources. **(06 Marks)**

b. Using source transformation and source shift method, reduce the network shown in Fig.Q1(b) to a single voltage source in series with a resistance.

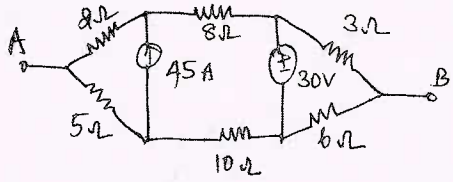

Fig.Q1(b) **(06 Marks)**

c. Find the current I using Mesh analysis for the circuit shown in Fig.Q1(c).

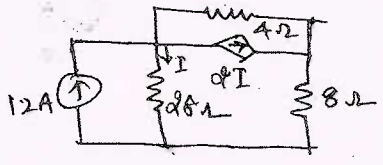

Fig.Q1(c) **(08 Marks)**

OR

2 a. Find the node voltages V_1 and V_2 for the circuit shown in Fig.Q2(a) using nodal analysis.

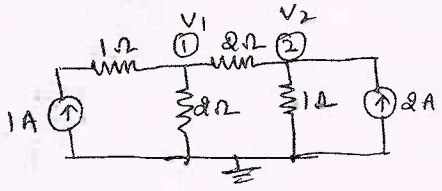

Fig.Q2(a) **(06 Marks)**

b. Determine the equivalent resistance between the terminals AB for the circuit shown in Fig.Q2(b) using Y-Δ transformation.

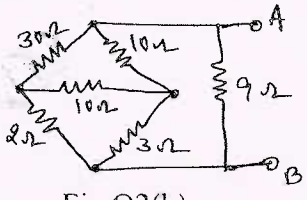

Fig.Q2(b) **(06 Marks)**

c. For the networks shown in Fig.Q2(c) draw the dual of the circuit. Also write the nodal equations for the dual network.

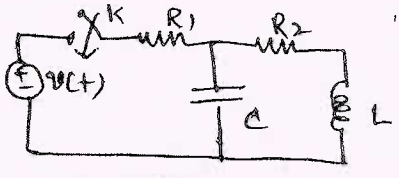

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Using superposition principle, find the current in 6 ohm resistor in the network shown Fig.Q3(a).

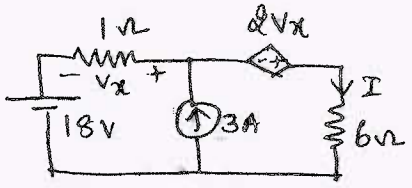

Fig.Q3(a) **(06 Marks)**

b. Calculate the Thevenin's equivalent circuit across AB for the network shown in Fig.Q3(b).

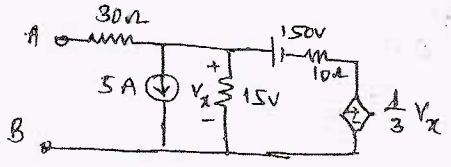

Fig.Q3(b) **(08 Marks)**

c. State and explain Norton's theorem. **(06 Marks)**

OR

4 a. State and prove maximum power transfer theorem for AC circuit. **(08 Marks)**

b. Find he current 'I' using Millman's theorem for the Fig.Q4(b).

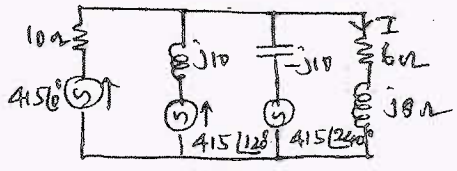

Fig.Q4(b) **(06 Marks)**

c. Find 'I_x' and verify reciprocity theorem for Fig.Q4(c).

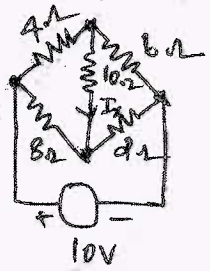

Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Derive an expressions for resonant frequency, half power frequencies, band width and quality factor for series resonant circuits. **(06 Marks)**

b. In the networks shown in Fig.Q5(b), switch 'K' is changed from position a to b at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

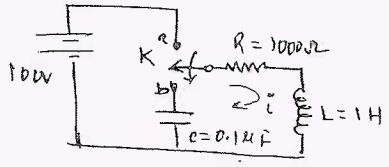

Fig.Q5(b) **(08 Marks)**

c. A series RLC circuit consists of R = 10Ω, L = 0.01H C = 0.01 μF is connected to 10mV supply. Determine : i) f_0 ii) Q – factor iii) band width iv) f_1 and f_2 v) I_0. **(06 Marks)**

OR

6 a. Discuss the behavior of R, L, C elements at :
i) The time of switching ($t = 0^+$) ii) the time of steady state ($t = \infty$). **(06 Marks)**

b. In the circuit shown in Fig.Q6(b) a steady state is reached with switch 'K' is open. At time $t = 0$, the switch is closed. Find the currents at $t = 0^+$. $i_1(t)$, $i_2(t)$, $\frac{di_1}{dt}(t)$.

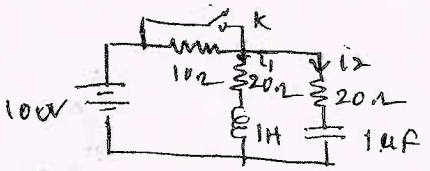

Fig.Q6(b) **(08 Marks)**

c. For the circuit show in Fig.Q6(c), find the value of capacitance 'C' so that the circuit will resonates at $W_0 = 5K$ rad/sec.

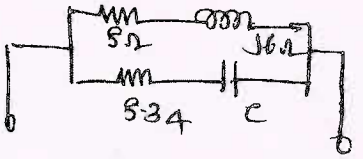

Fig.Q6(c) **(06 Marks)**

Module-4

7 a. State and prove initial value and final value theorem. **(06 Marks)**

b. Find the Laplace transform of the following : i) $\sin \omega t$ ii) $\cos \omega t$ iii) $e^{-at} \sin \omega t$ iv) $e^{-at} \cos \omega t$. **(08 Marks)**

c. Obtain the Laplace transform of the following function shown in Fig.Q7(c).

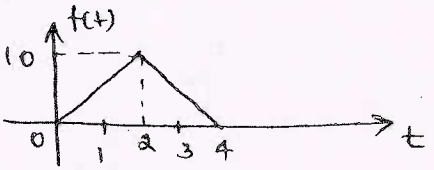

Fig.Q7(c) **(06 Marks)**

OR

8 a. Find the inverse Laplace transform of the following :

i) $F(s) = \frac{s+2}{s(s+3)(s+4)}$ ii) $F(s) = \frac{(s-2)}{s(s+1)^3}$. **(06 Marks)**

b. Find the Laplace transform of the following waveform shown in Fig.Q8(b).

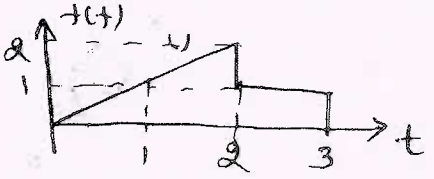

Fig.Q8(b) **(08 Marks)**

c. Using Laplace transform define the current i(t) in the circuit shown in Fig.Q8(c). When switch 'S' is closed at $t = 0$.

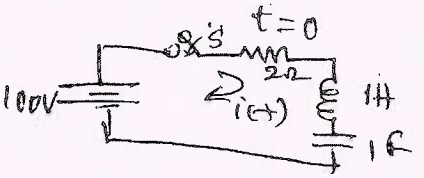

Fig.Q8(c) **(06 Marks)**

Module-5

9 a. Define Z and Y parameters with equivalent diagram. **(06 Marks)**

b. Determine the line currents in an unbalanced star connected load supplied from a symmetrical 3-phase, 440V, system. The branch impedance are $Z_R = 4\angle 30°\Omega$, $Z_Y = 10\angle 45\Omega$, $Z_B = = 10\angle 60°\Omega$. The phase sequence is RYB. **(08 Marks)**

c. Find Y-Parameters for the circuit shown in Fig.Q9(c).

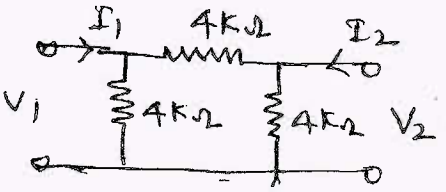

Fig.Q9(c) **(06 Marks)**

OR6

10 a. Obtain hybrid parameters interms of impedance parameters. **(06 Marks)**

b. Obtain Z-parameters of the circuit shown in Fig.Q10(b).

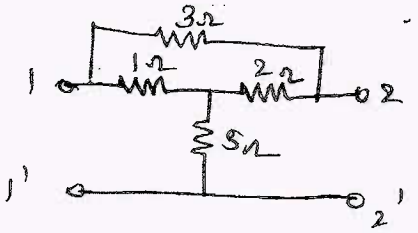

Fig.10(b) **(08 Marks)**

c. The circuit shown in Fig.Q10(c) is supplied by a 240V, 3phase, 4 wire system. Taking V_{ab} reference, calculate : i) phase voltage ii) Line and phase currents.

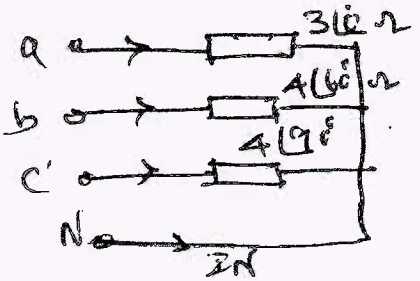

Fig.10(c) **(06 Marks)**

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CBCS SCHEME

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17EE33

Third Semester B.E. Degree Examination, Aug./Sept.2020
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the phasor diagram of practical transformer on load for resistive, inductive and capacitive load. **(08 Marks)**

b. A transformer has its maximum efficiency of 98% at 15kVA at unity power factor. During the day it is loaded as:
12 hours : 2kW at power factor 0.5lag
6 hours : 12kW at power factor 0.8lag
6 hours : 18kW at power factor 0.9lag
Find the all day efficiency. **(08 Marks)**

c. Explain open Delta (V-V) connection and show that it has KVA rating of 57.7% of Delta-Delta connection. **(04 Marks)**

OR

2 a. State the advantages of single 3 phase transformer over bank of three single phase transformer units. **(06 Marks)**

b. Explain equivalent circuit of single phase transformer refereed to primary side. **(06 Marks)**

c. Two electric furnaces are supplied with 1 phase current at 80V from a 3 phase 11kV system by means of two single phase Scott connected transformer with similar secondary windings, when the load on one furnace is 500kW and on the other 800kW, what current will flow in each of the 3 lines? i) at upf ii) at 0.8pf lag on furnace 2. **(08 Marks)**

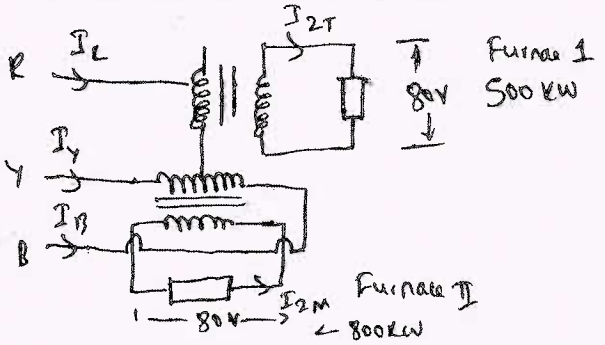

Fig.Q.2(c)

Module-2

3 a. With neat sketch, explain Sumpner's test conducted on single phase transformer. **(08 Marks)**

b. What are the conditions for parallel operation of transformers? **(06 Marks)**

c. Two single phase transformers rated 250kVA each other are operated in parallel on both sides. Impedance of transformer are $(1 + j6)\Omega$ and $(1.2 + j4.8)\Omega$ respectively. Find the load shared by each when the total load is 500kVA at 0.8pf lag. **(06 Marks)**

OR

4 a. Explain the construction of autotransformer and also show copper saving in it. **(08 Marks)**

b. With necessary circuit and phasor diagram explain parallel operation of transformer with unequal voltage ratio. Also derive equation for circulating current. **(06 Marks)**

c. Write a short note on tap changing transformer and explain its types. **(06 Marks)**

Module-3

5 a. What is the necessity of Tertiary winding? **(06 Marks)**

b. What is the armature reaction in DC machine? Explain it with neat sketch. **(08 Marks)**

c. A 4 pole DC generator has a wave connected armature with 722 conductor and it delivers 100A on full load. If the brush lead is 8°. Calculate the armature demagnetizing and cross magnetizing ampere turns. **(06 Marks)**

OR

6 a. Derive the emf equation of an alternator. **(06 Marks)**

b. What is commutation? With neat diagram explain the process of commutation and also describe the methods to improve the commutation. **(10 Marks)**

c. How to eliminate harmonics in alternator? Explain. **(04 Marks)**

Module-4

7 a. With neat diagram explain slip test on non salient pole alternator. **(08 Marks)**

b. Explain V-curves of alternator. **(04 Marks)**

c. With proper phasor diagram, explain general load characteristics of alternator for unity, leading and lagging pf. **(08 Marks)**

OR

8 a. Define two reaction theory and explain it. **(10 Marks)**

b. What is voltage regulation in alternators? **(04 Marks)**

c. Explain the behavior of synchronous generator on no load under variable excitation connected to infinite bus bar. **(06 Marks)**

Module-5

9 a. What is short circuit ratio? Explain its significance. **(06 Marks)**

b. A 50kVA, 500V single phase alternator gives the following results on
OC test : 12A field current produces emf of 300volts
SC test : 12A field current causes 175A to flow in short circuited armature effective armature resistance is 0.2Ω using this calculate synchronous impedance and reactance.
If alternator supplying a full load current of 100A at 0.8pf lag and sudden load is removed what will be the voltage regulation? **(08 Marks)**

c. Write a short note on hunting and role of damper windings to prevent hunting. **(06 Marks)**

OR

10 a. Explain the capability curves of alternator. **(06 Marks)**

b. With proper diagrams, explain procedure of ZPF method for predetermination of voltage regulation. **(08 Marks)**

c. Explain the necessity and methods of synchronization of alternators. **(06 Marks)**

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CBCS SCHEME

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17EE35

Third Semester B.E. Degree Examination, Aug./Sept.2020
Digital System Design

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Convert the following equations into proper canonical form:
i) f(A, B, C) = A + ABC into standard SOP form.
ii) f(A, B, C) = A.(A + B + C) into standard POS form. **(10 Marks)**

b. Reduce the following function using K-Map technique:
f(A, B, C, D, E) = $\sum$m (1, 4, 8, 10, 11, 20, 22, 24, 25, 26) + $\sum$d(0, 12, 16, 17) **(10 Marks)**

OR

2 a. Simply the following using Quine-McCluskey method:
f(A, B, C, D) = $\sum$m(1, 2, 3, 5, 9, 12, 14, 15) + $\sum$d(4, 8, 11) **(10 Marks)**

b. Design a logic circuit with inputs P, Q, R so that output Y is high whenever P is zero or whenever Q = R = 1. **(10 Marks)**

Module-2

3 a. i) Implement f(A, B, C) = $\sum$m(1, 3, 5, 6) using 4:1 multiplexer.
ii) Implement f(P, Q, R, S) = $\sum$m(0, 1, 3, 4, 8, 9, 15) using 8:1 multiplexer. **(10 Marks)**

b. Explain the concept of look ahead adder and hence realize 3 bit parallel adder using Look ahead carry generator. **(10 Marks)**

OR

4 a. Implement full subtractor using 3:8 decoder. **(10 Marks)**

b. Design 2-bit magnitude comparator using gates. **(10 Marks)**

Module-3

5 a. Explain the operation of gated S-R flipflop using NAND gates, with truth table. **(10 Marks)**

b. Design synchronous MOD-6 counter using S-R flip flop. **(10 Marks)**

OR

6 a. With logic diagram, explain the working of master slave J-K flip flop along with waveforms. Explain about race around condition. **(10 Marks)**

b. Design synchronous mod-3 counter using J-K flip flop. **(10 Marks)**

Module-4

7 a. Construct the transition table, state table and state diagram for the given synchronous sequential circuit. **(10 Marks)**

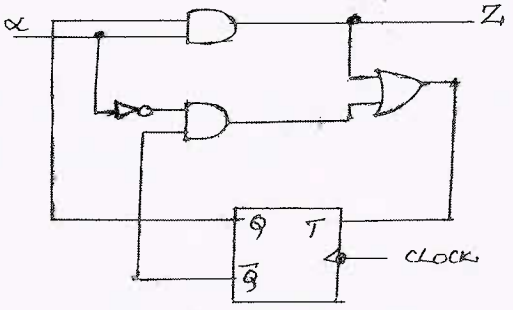

Fig.Q.7(a)

b. Obtain transition table and excitation table for the given state diagram. **(10 Marks)**

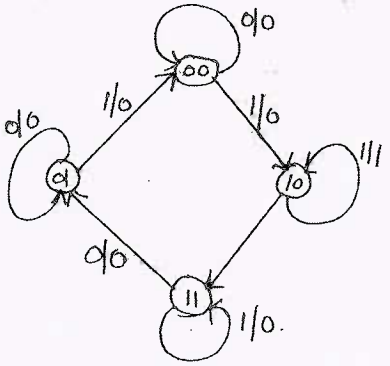

Fig.Q7(b)

OR

8 a. Construct the transition table, state table and state diagram for the Moore sequential circuit. **(12 Marks)**

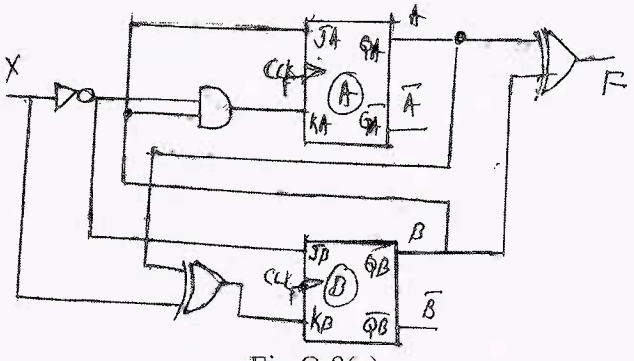

Fig.Q.8(a)

b. Compare Moore model and Mealy Model. **(08 Marks)**

Module-5

9 a. Write data flow description for full adder in both VHDL and verilog. **(10 Marks)**

b. Compare VHDL and verilog. **(10 Marks)**

OR

10 a. Describe different operators in VHDL and verilog. **(10 Marks)**

b. Briefly describe different styles of descriptions in VHDL. **(10 Marks)**

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CBCS SCHEME

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15EE32

Third Semester B.E. Degree Examination, Aug./Sept.2020
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Reduce the circuit shown in Fig.Q1(a) to a voltage source in series with a resistance between the terminals AB.

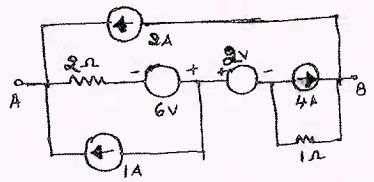

Fig.Q1(a) **(06 Marks)**

b. Find the single delta equivalent circuit of the circuit shown in Fig.Q1(b).

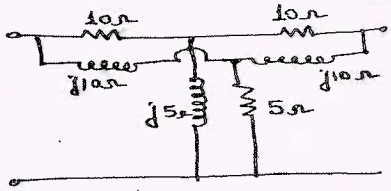

Fig.Q1(b) **(07 Marks)**

c. In Fig.Q1(c), R = R_L = 1 Ω, L = 1H and C = 0.5F. Find the resonance frequency and the admittance at the resonant frequency.

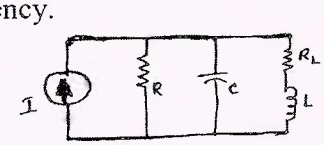

Fig.Q1(c) **(03 Marks)**

OR

2 a. In the circuit shown in Fig.Q2(a), find I_o using mesh analysis method.

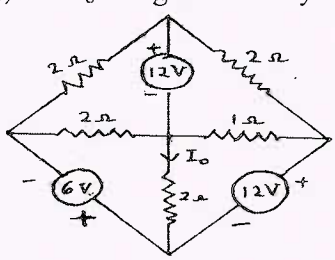

Fig.Q2(a) **(06 Marks)**

b. Using Node-analysis method, find the current through 12 Ω resistor in the circuit shown in Fig.Q2(b).

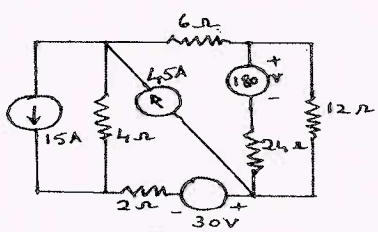

Fig.Q2(b) **(06 Marks)**

c. Construct the dual network for the network shown in Fig.Q2(c).

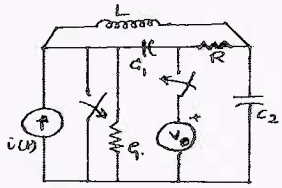

Fig.Q2(c) **(04 Marks)**

Module-2

3 a. Using superposition theorem find the current I in the circuit shown in Fig.Q3(a).

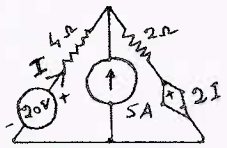

Fig.Q3(a) **(05 Marks)**

b. State and verify the reciprocity theorem for the network shown in Fig.Q3(b).

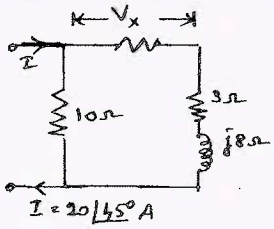

Fig.Q3(b) **(05 Marks)**

c. In the network shown in Fig.Q3(c), find the current I using Thevenin's theorem.

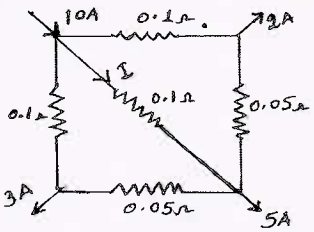

Fig.Q3(c) **(06 Marks)**

OR

4 a. Find the Norton's equivalent of the circuit shown in Fig.Q4(a).

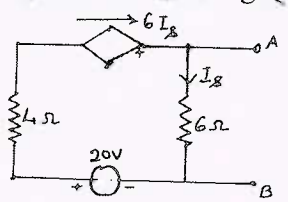

Fig.Q4(a) **(04 Marks)**

b. In the network shown in Fig.Q4(b), find Z_L so that it makes maximum power and determine the maximum power.

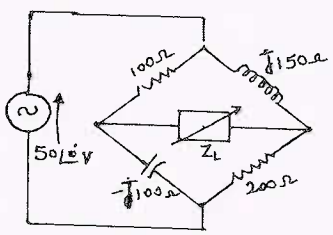

Fig.Q4(b) **(08 Marks)**

c. State and prove Millman's theorem. **(04 Marks)**

Module-3

5 a. For the network shown in Fig.Q5(a), find the values of nodal voltages, their first and second derivatives at $t = 0_+$. For $t < 0$, all switches are closed. At $t = 0$, they are opened $I_{a(0-)} = 1$ A, $V_{2(0-)} = 0$ V.

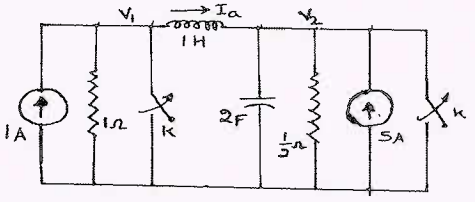

Fig.Q5(a) **(10 Marks)**

b. In the network shown in Fig.Q5(b), switch k is closed at $t = 0$ with zero current in the inductor. Find i(t), $\frac{d}{dt}i(t)$ at $t = 0_+$ and obtain an expression for i(t) at $t \geq 0$ by classical method.

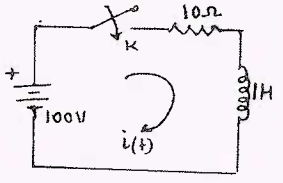

Fig.Q5(b) **(06 Marks)**

OR

6 a. The switch k in the network of the Fig.Q6(a) is closed at $t = 0$, connecting the battery to an unenergized network. Determine i, V_1, $\frac{d}{dt}i$, $\frac{d^2}{dt^2}i_1$ and $\frac{d}{dt}V_1$ at $t = 0_+$.

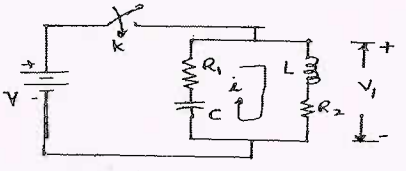

Fig.Q6(a) **(10 Marks)**

b. In the network shown in Fig.Q6(b), the switch k is closed at $t = 0$ a steady-state having previously been attained. Solve for the current in the circuit as a function of time.

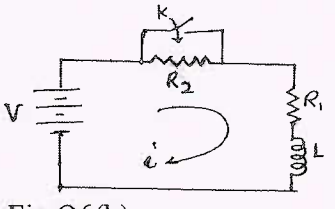

Fig.Q6(b) **(06 Marks)**

Module-4

7 a. State and prove Initial and Final value theorem. **(05 Marks)**

b. At $t = 0$ the switch is closed. Using Laplace transform determine $i_1(t)$ and $i_2(t)$ shown in Fig.Q7(b). The initial currents through the inductors are $i_{1(0)} = 1$A and $i_{2(0)} = 2$A.

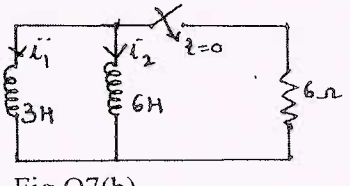

Fig.Q7(b) **(08 Marks)**

c. State and prove Shifting theorem. **(03 Marks)**

OR

8 a. Find the Transform of voltage V(t) of waveform shown in Fig.Q8(a).

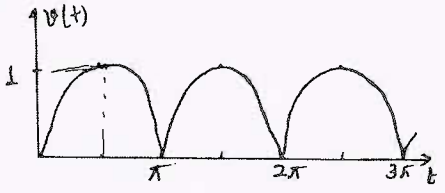

Fig.Q8(a) **(10 Marks)**

b. Find the initial and final values of i(t) using initial and final value theorems:

(i) $I(s) = \frac{(s^2+5)}{(s^3+2s^2+4s)}$ (ii) $I(s) = \frac{8(s^2+2s+1)}{(s+2)(s^2+4)}$ **(06 Marks)**

Module-5

9 a. A star-connected unbalanced system of impedance of 20Ω, (16+j12)Ω and (16 – j12)Ω in the phases R, Y and B is being supplied by a 400V balanced, 3ϕ generator with phase sequence RYB. Determine the line currents, current in the neutral line and the power supplied to the load, when the neutrals are connected. **(06 Marks)**

b. Define Transmission parameters. **(04 Marks)**

c. Determine the expression for current i(t) in the circuit shown in Fig.Q9(c), when the applied voltage is given by $e(t) = 10 + 100\sin(100t + 30°) + 50\sin(300t + 60°) + 20\cos(500t + 30°)V$

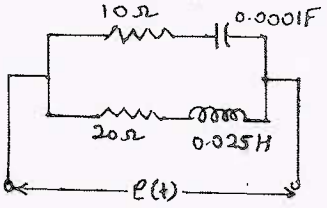

Fig.Q9(c) **(06 Marks)**

OR

10 a. Find the transmission parameters for the circuit shown in Fig.Q10(a).

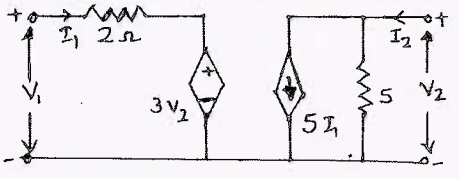

Fig.Q10(a) **(08 Marks)**

b. Determine $G_{21}(s)$ and $Y_{12}(s)$ for the network shown in Fig.Q10(b).

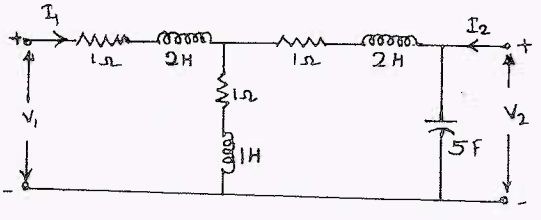

Fig.Q10(b) **(08 Marks)**

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CBCS SCHEME

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15EE33

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume Missing data if any.***

Module-1

1 a. Draw the exact equivalent circuit of a single phase transformer. From this derive the approximate and simplified equivalent circuit of the transformer. **(08 Marks)**

b. A three phase transformer bank consisting of three 1-phase transformers is used to step down the voltage of a 3-phase, 6600V transmission line. If the primary line current is 10A, calculate the secondary line voltage, line current and output KVA for the following connections.
i) Y/Δ (Star/Delta) ii) Δ/Y (Delta/Star)
The turn's ratio is 12, Neglect losses. **(08 Marks)**

OR

2 a. A single phase 250/500V transformer gave the following results :
Open circuit test : 250V, 1A, 80W on l.v side
Short circuit test : 20V, 12A, 100W on h.v side
Calculate the circuit constants and shown them on equivalent circuit. **(08 Marks)**

b. Explain with the help of connections and phasor diagrams how scott connections are used to obtain two phase supply from three phase supply mains. **(08 Marks)**

Module-2

3 a. What are the conditions for the satisfactory parallel operation to single phase transformers? Deduce the expressions for the load shared by two transformers in parallel when no-load voltages of these transformers are not equal. **(08 Marks)**

b. Enumerate the various purposes which dictate the use of a tertiary winding. Obtain the equivalent circuit of a three winding transformer. **(08 Marks)**

OR

4 a. Two transformers A and B are connected in parallel to a load of (2 + j1.5) ohms, their impedances in secondary terms are $Z_A = (0.15 + j\ 0.5)$ ohms and $Z_B = (0.1 + j\ 0.6)$ ohms. Their no load voltages are $E_A = 207\ \angle 0^\circ$ volt and $E_B = 205\angle 0^\circ$ volt. Find the power output and power factor of each transformer. **(08 Marks)**

b. Derive an expression for saving in conductor material in an autotransformer over a two-winding transformer of equal rating, state the advantages and disadvantages of autotransformers over two-winding transformers. **(08 Marks)**

Module-3

5 a. What are the causes and effects of harmonics in the transformers? How the effects of harmonics are minimized? **(06 Marks)**

b. What is armature reaction? Explain with neat sketches the effect of armature reaction is DC Generators. **(05 Marks)**

c. Define the terms synchronous reactance and voltage regulation of an alternator. **(05 Marks)**

OR

6 a. With a neat circuit diagram, explain the Sumpner's test on single phase transformer. **(05 Marks)**

b. Define commutation. Explain the process of commutation in DC Generators with neat sketches. **(06 Marks)**

c. Derive emf equation for an alternator, explain the significance of winding factor. **(05 Marks)**

Module-4

7 a. Explain Synchronous Generator load characteristics. **(08 Marks)**

b. Explain the two reaction theory applicable to salient pole synchronous machine. **(08 Marks)**

OR

8 a. What do you mean by Synchronizing of Alternators? What are the conditions for Synchronization? Describe any one method of Synchronizing of Alternators. **(08 Marks)**

b. Explain the determination X_d and X_q of a salient pole synchronous machine by slip text. **(08 Marks)**

Module-5

9 a. Explain how open circuit and short circuit tests are conducted an a Synchronous and Generator. What is the air gap line? **(08 Marks)**

b. What do you mean by hunting of a Synchronous Generator? What are causes and effects of hunting? How the hunting effects are reduced? **(08 Marks)**

OR

10 a. From the following test results, determine the voltage regulation by EMF method of a 2000V 1-phase alternator delivering a current of 100A at

i) unity power factor
ii) 0.8 leading power factor
iii) 0.71 lagging power factor.

Test results: Full load current of 100A is produced on short circuit by a field excitation of 2.5A. An emf of 500V is produced on open circuit by the same excitation. The armature resistance is 0.8 ohms. **(08 Marks)**

b. What is capability curve of a Synchronous Generator? Draw the capability curve of synchronous generator. **(08 Marks)**

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15EE34

Third Semester B.E. Degree Examination, Aug./Sept.2020
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 80

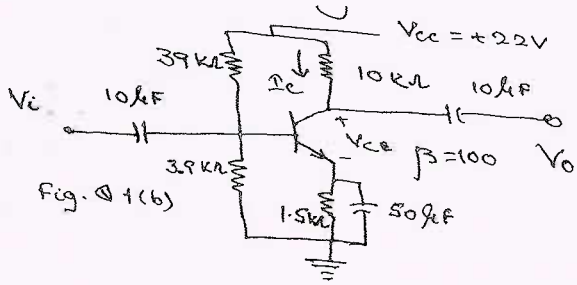
Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define Clamper. Explain operation of a negative clamper, with a diagram. **(05 Marks)**

b. Determine dc bias voltage V_{CE} and current I_C for the network shown in fig. Q1(b) using exact analysis. **(05 Marks)**

Fig. Q1(b)

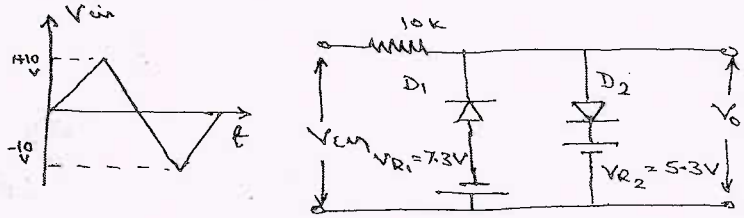


c. Define Stability factors of a transistor. Derive expressions for $S(I_{CO})$ and $S(V_{BE})$ for Fixed Bias Circuit. **(06 Marks)**

OR

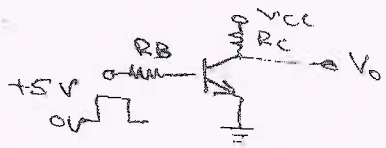
2 a. For the circuit shown in fig. 2(a) sketch output waveform and transfer characteristic for cut in voltage = 0.7V. **(08 Marks)**

Fig. Q2(a)



b. Explain functioning of transistor switch circuit. Calculate resistor R_B value that saturates the transistor switch when $V_i = +5V$, $R_c = 1K$, $\beta = 100$, $V_{CC} = +5V$ and $V_{CE_{sat}} = 0.2V$.

Fig. Q2(b)



(08 Marks)

Module-2

3 a. Draw AC equivalent circuit with r_e model for a CE amplifier with voltage divider biasing and derive expressions for voltage gain, current gain , input and output impedances. **(08 Marks)**

b. Describe factors that affect low frequency response of a BJT CE amplifier. Derive expressions for lower cut off frequencies due to C_S , C_C and C_E capacitances. **(08 Marks)**

OR

4 a. Explain Hybrid equivalent model for a transfer. Draw h – parameter models for CE and CB configurations. **(05 Marks)**

b. Derive expressions for Miller input ($CM_i = (1 - AV)\, C_f$) and Miller output capacitance ($CM_O = (1 - \frac{1}{AV})\, C_f$). **(06 Marks)**

c. Define f_α , f_β and f_T and state relation between f_β and f_T. **(05 Marks)**

Module-3

5 a. What is CASCODE connection / configuration? List important characteristics. **(05 Marks)**

b. Explain the four types of feedback connections. Give one example of a practical feedback circuit. **(06 Marks)**

c. Determine Voltage gain, Input and Output impedances with feedback for a voltage series feedback circuit having A = - 100 , Z_i = 10kΩ , Z_o = 20 kΩ with β = - 0.1. **(05 Marks)**

OR

6 a. For the Cascaded arrangement shown in fig.Q6(a), calculate loaded gains for each stage, total gains AV_T, AV_S , total current gain AI_T and phase relationship between V_i and V_o.

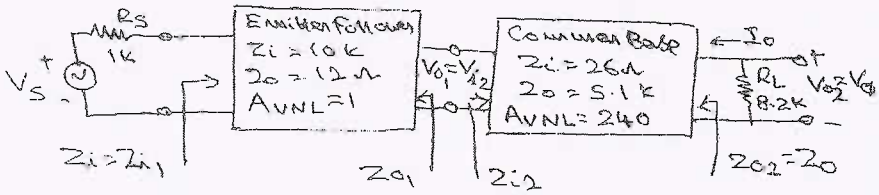


Fig. Q6(a) **(08 Marks)**

b. With an equivalent circuit diagram for a Darlington Emitter follower, derive expressions for Z_{in} , A_I , Z_O and A_V. **(08 Marks)**

Module-4

7 a. Derive expression for conversion efficiency of Transformed Coupled Class A Power amplifier. **(06 Marks)**

b. Calculate harmonic distortion components and Total Harmonic distortion for an output signal having Fundamental amplitude of 2.5V , Second harmonic amplitude of 0.25V , Third harmonic amplitude of 0.1V and Fourth harmonic amplitude of 0.05V. **(05 Marks)**

c. Explain basic principle of oscillators and effect of loop gain (Aβ) on output of oscillator. **(05 Marks)**

OR

8 a. Draw the circuit of class B push pull power amplifier and explain operation with neat input and output wave forms. **(08 Marks)**

b. Draw circuit diagram of RC phase shift oscillator and derive expression for the frequency of operation. **(08 Marks)**

Module-5

9 a. Compare BJT with FET. **(05 Marks)**

b. Determine V_{GSQ} ,T_{DQ} and V_{DS}, V_D for circuit shown in fig. Q9(b). **(06 Marks)**

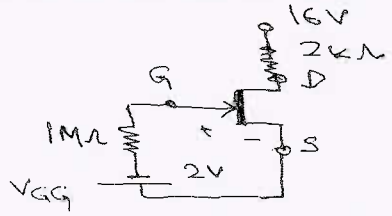


Fig. Q9(b)

c. Explain working of n – channel Enhancement MOSFET, with neat diagram. **(05 Marks)**

OR

10 a. With the help of Small signal model, derive expressions for Voltage gain, input and output impedances of a common source JFET amplifier with Fixed bias. **(08 Marks)**

b. Explain Construction and Operation of n – channel Depletion type MOSFET. Draw the characteristics. **(08 Marks)**

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15EE35

Third Semester B.E. Degree Examination, Aug./Sept.2020
Digital System Design

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define combinational logic. List the various steps in designing combinational logic system. **(05 Marks)**

b. Simplify the following expression using K-map and implement using basic gates, $f(a, b, c, d) = \sum m(0, 1, 2, 5, 6, 7, 8, 9, 10) + d(13, 14, 15)$. **(06 Marks)**

c. Find the minimal sum using MEV technique with a, b, c as map variables for the given function $f(a, b, c, d) = \sum(3, 4, 5, 7, 8, 11, 12, 13, 15)$ **(05 Marks)**

OR

2 a. Explain canonical minterm form and maxterm form expressions with examples. **(04 Marks)**

b. Express the following Boolean expression into minterm canonical form $f(w, x, y, z) = (w' + x)(y + z)$ **(04 Marks)**

c. Obtain all the prime implicants of the following function using Quine-Mccluskey method $f(a, b, c, d) = \sum(0, 2, 3, 5, 8, 10, 11)$ **(08 Marks)**

Module-2

3 a. Distinguish between decoder and encoder. **(03 Marks)**

b. Implement the following function using 3 to 8 line decoder with active low output and explain implementation $f(a, b, c) = a\bar{b} + bc$ **(07 Marks)**

c. Implement the expression $y = ad + b\bar{c} + bd$ using 8:1 MUX with least significant bits as select inputs. **(06 Marks)**

OR

4 a. Implement full adder circuit using 74153 4:1 MUX. **(06 Marks)**

b. Explain 4-bit parallel adder with block diagram. **(04 Marks)**

c. Design a two-bit binary comparator using logic gates. **(06 Marks)**

Module-3

5 a. What is a Flip-Flop? Explain the working of edge triggered D Flip-Flop with its functional table. **(08 Marks)**

b. Design a synchronous Mod-6 counter using clocked JK Flip-Flop. **(08 Marks)**

OR

6 a. Explain the working of pulse triggered J-K Master-slave Flip-Flop with its logic symbol and truth table. **(08 Marks)**

b. What is meant by universal shift register? Explain the principle of operation of 4-bit universal shift register. **(08 Marks)**

Module-4

7 a. Explain Mealy Model for a clocked sequential circuit. **(06 Marks)**

b. For the state diagram shown in Fig.Q.7(b), write the excitation table and state table with R.S. Flip-Flop. **(05 Marks)**

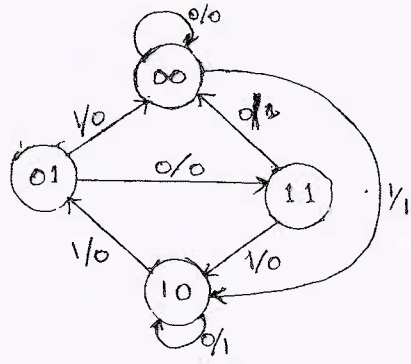

Fig.Q.7(b)

c. Write the step-by-step procedure for the design of clocked synchronous sequential circuit. **(05 Marks)**

OR

8 a. Explain Moore model for a synchronous sequential circuit. **(06 Marks)**

b. Give the output function, transition table and state diagram by analyzing the sequential circuit shown in Fig.Q.8(b) **(10 Marks)**

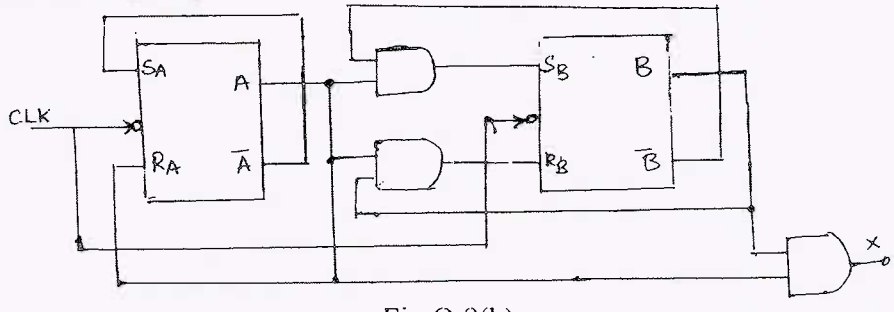

Fig.Q.8(b)

Module-5

9 a. Explain the structure of VHDL module. **(04 Marks)**

b. Mention the types of HDL descriptions. Explain dataflow and behavioral descriptions. **(06 Marks)**

c. Write a dataflow description for a full adder with active high enable, in both VHDL and verilog module. **(06 Marks)**

OR

10 a. If A, B, C are three unassigned variables with A = 11110000, B = 01011101, C = 00000000 find the value of

i) A NAND B ii) A && C iii) ~1B iv) A rov 2 v) ! B **(05 Marks)**

b. List the data types classification VHDL. Mention advantages of VHDL data types over verilog. **(06 Marks)**

c. Give comparison between VHDL and verilog. **(05 Marks)**

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CBCS SCHEME

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17EE42

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Power Generation and Economics

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Mention the factors to be considered for the selection of site for a hydroelectric power plant. **(06 Marks)**

b. Explain the working of pumped storage power plant stating its advantages with a neat diagram. **(08 Marks)**

c. Classify the hydro-electric turbines. With a neat sketch, explain the working of a reaction turbine. **(06 Marks)**

OR

2 a. Explain how hydro electric power plants are classified. **(06 Marks)**

b. Explain the general arrangements and operation of a hydro – electric plant with neat schematic diagram. **(08 Marks)**

c. With a neat diagram explain the working of the turbine governing. **(06 Marks)**

Module-2

3 a. Explain briefly the fuel combustion in a thermal power plant. **(04 Marks)**

b. Write a short note on :
i) Economiser ii) Cooling towers iii) Air preheater iv) Condenser. **(08 Marks)**

c. Describe the auxiliary equipments of diesel engine power plant. **(08 Marks)**

OR

4 a. Mention the applications of diesel electric power plant. **(06 Marks)**

b. With a neat diagram explain the schematic arrangement of a thermal power station. **(08 Marks)**

c. How the use of regenerator and reheator in gas turbine plants help in improvement in thermal efficiency? Explain briefly. **(06 Marks)**

Module-3

5 a. What are nuclear fuels? Classify the nuclear reactors and explain briefly boiling water reactor(BWR). **(08 Marks)**

b. List out the advantages of nuclear power plant. **(06 Marks)**

c. Explain the following with reference to a nuclear power plant
i) nuclear waste disposal ii) shielding. **(06 Marks)**

OR

6 a. Discuss some of the safety measures incorporated nuclear plant. **(06 Marks)**

b. Explain the operation of fast breeder reactor with a neat diagram. **(06 Marks)**

c. With a neat sketch explain the major parts of a nuclear power plant.. **(08 Marks)**

Module-4

7 a. Why grounding is required in an electric installations? Explain resonant grounding and earthing transformer briefly. **(08 Marks)**

b. Draw a single line diagram of a substation and explain it. **(06 Marks)**

c. Compare the indoor and outdoor substations with their functions. **(06 Marks)**

OR

8 a. What are the functions of substations? **(06 Marks)**

b. Explain with a diagram double bus bar scheme with single breaker and also list out the main drawbacks of this scheme. **(08 Marks)**

c. Differentiate the functions of an isolator and a circuit breaker. **(06 Marks)**

Module-5

9 a. Define power factor. What are the effects of low power factors? Discuss the various methods for p.f. improvements. **(08 Marks)**

b. Mention the main objectives in framing a tariff. **(06 Marks)**

c. Explain the demand factor, diversity factor and load factor for a power station. **(06 Marks)**

OR

10 a. What are the different types of tariffs? Explain them briefly. **(08 Marks)**

b. List out the factors to be considered while deciding the number of generating units. **(06 Marks)**

c. A power station is to supply three regions of load whose peak loads are 20MW, 15MW and 25MW. The annual load is 50% and the diversity factor of the load at station is 1.5, determine the following :

i) Max. demand on station

ii) Installed capacity suggesting member of units

iii) Annual energy supplied. **(06 Marks)**

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CBCS SCHEME

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17EE43

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Transmission and Distribution

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the various structures used in overhead transmission lines. **(06 Marks)**

b. Explain how importance of high voltage transmission on:
(i) Volume of conductor (ii) Line losses **(06 Marks)**

c. An overhead transmission line has a span of 200 m between supports at same level. The area of cross-section of conductor is 1.9 cm^2 while the ultimate strength is 5000 kg/cm^2. The specific gravity of the conductor material is 8.9 g/cm. If the conductor is subjected to a wind pressure of 1.5 kg/m. Calculate the sag, if factor of safety is 5. Also calculate the vertical sag. **(08 Marks)**

OR

2 a. Mention different types of insulators. Explain any one with neat figure. **(06 Marks)**

b. Derive the expression for sag in an overhead line conduction by the towers situated at different level. **(06 Marks)**

c. A three-phase overhead transmission line is being supported by three disc connection insulators, the potentials across the first and second insulators are 7 KV and 12 KV respectively. Find: (i) Line voltage (ii) The ratio of capacitance between pin and earth to self capacitance (iii) String efficiency **(08 Marks)**

Module-2

3 a. Derive the expression for a capacitance of a single phase line. **(06 Marks)**

b. Briefly explain skin effect and proximity effect. **(06 Marks)**

c. Two conductors of a single phase line, each of 1 cm diameter are arranged in a vertical plane with one conductor mounted 1m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25 m apart from it. The two upper and lower two conductors are connected in parallel. Determine the inductance/km of the resulting double circuit line. **(08 Marks)**

OR

4 a. Derive the expression for inductance of a 3-phase symmetrically spaced transmission line. **(06 Marks)**

b. A 3-phase circuit 50 Hz line consists of 3 conductors each of diameter 21 mm. The spacing between conductors is as shown in Fig.Q4(b).

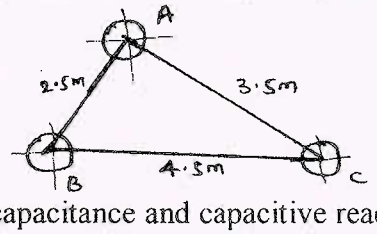

Fig.Q4(b)
diameter of each conductor = 21 mm

Find the capacitance and capacitive reactance/phase/km of the line. The line is transposed at regular intervals. **(06 Marks)**

c. Find the capacitance of a single phase line 40 km long consisting of two parallel wires each 4 mm in radius and 2m apart. Determine the capacitance of the line taking into account effect of ground. The height of conductors above ground is 5m. **(08 Marks)**

Module-3

5 a. Discuss the nominal T-model of medium transmission line with appropriate circuit diagram and phasor diagram and hence obtain the expressions for regulation and ABCD constants for the same. **(10 Marks)**

b. A 3-phase short transmission line delivers 3 MW at a power factor of 0.8 lagging to a load. If the sending end voltage is 33 KV. Determine: (i) Receiving end voltage (ii) Line current (iii) Transmission efficiency (iv) Regulation. The resistance and reactance of each conductor are 5Ω and 8Ω respectively. **(10 Marks)**

OR

6 a. Briefly explain the classification of overhead transmission line. Also define voltage regulation and transmission line efficiency. **(07 Marks)**

b. Write a short note on Ferranti effect. **(05 Marks)**

c. Derive the expression for ABCD parameter constants of a medium transmission using π - method. Show that AD – BC = 1. **(08 Marks)**

Module-4

7 a. Explain the phenamenon of corona in overhead transmission lines. **(06 Marks)**

b. Show that in a single core cable, the ratio of $\frac{g_{max}}{g_{min}} = \frac{D}{d}$ where 'D' is diameter of sheath and 'd' is core diameter. **(06 Marks)**

c. A single core lead covered cable has a conductor diameter of 3 cm with insulation diameter of 8.5 cm. The cable is insulated with two dielectrics of permitivities 5 and 3 respectively. The maximum stresses in two dielectrics are 38 KV/cm and 26 KV/cm respectively. Calculate radial thickness of insulating layers and working voltage of the cable. **(08 Marks)**

OR

8 a. Draw the cross sectional view of a single core cable and explain its construction. **(06 Marks)**

b. A 33 KV, three phase underground cable, 4m long uses 3 single core cables. Each of the conductor has a diameter of 2.5 cm and the radial thickness of insulation 0.5 cm. The relative permittivity of dielectric is 3. Find: (i) Capacitance of cable/phase (ii) Charging current/phase (iii) Total charging KVAR **(06 Marks)**

c. Show that in a cable using two intersheaths the maximum stress in the dielectric reduces by the factor $\frac{1}{\frac{1}{3}(1+\alpha+\alpha^2)}$ of the maximum stress in an ungraded cable, if $\frac{d_1}{d} = \frac{d_2}{d_1} = \frac{D}{d_2} = \alpha$. **(08 Marks)**

Module-5

9 a. What are requirements of good distribution system? **(05 Marks)**

b. What is power quality? What are different power quality problems? **(06 Marks)**

c. A single phase ring distributor is fed at point A. The loads at points B and C are 50 A at 0.6 p.f. lag and 0.8 p.f lag respectively. Both p.f. are with reference to voltage at point A. The impedances of section AB = (1.4 + J1.4)Ω, section BC = (2 + J4)Ω and section CA = (2 +J3)Ω. Find current in each section. **(09 Marks)**

OR

10 a. Write a short note on: (i) Reliability and (ii) Bath tub curve. **(06 Marks)**

b. What are the limitations of distribution system? **(06 Marks)**

c. A single phase distributor, 1 km long has a resistance and reactances of 0.4Ω and 0.6Ω (go and return) respectively. The voltage at the far end is V_C = 230 V and the current at C is 100 A at a p.f of 0.8 lag. At the midpoint B of the distributor, a current of 100 A at a p.f of 0.6 lag with reference to the voltage V_B. Calculate the supply voltage V_A and phase angle between sending end A and receiving (far) end C. **(08 Marks)**

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17EE44

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Electric Motors

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Derive an expression for the armature torque of D.C. Motor. **(06 Marks)**

b. Draw the power flow diagram for D.C. Motor. Also, explain the various losses which occur in D.C. Motors. **(07 Marks)**

c. The full load current of D.C. shunt motor is 80A at 220V. The shunt field current is 12A and armature resistance 0.055Ω. Find i) Total copper losses ii) Efficiency of the motor. Consider the stray losses of 1000 watts. **(07 Marks)**

OR

2 a. Draw and explain the characteristics of D.C. Shunt motor. **(06 Marks)**

b. With a neat circuit diagram, explain the methods of speed control for D.C. Shunt motor. Justify , which method is more significant, why? **(08 Marks)**

c. A 250V D.C. Series motor is running at 600 RPM by taking 60A of current. The armature resistance and series field resistance and 0.2Ω and 0.05Ω respectively. Calculate the speed when current drawn by the motor is 40A. **(06 Marks)**

Module-2

3 a. Draw and explain the torque – slip characteristics for three phase induction motor. **(06 Marks)**

b. The following readings are obtained from Swinburnk's test performed on D.C. Shunt motor : V = 220V , $R_a = 0.8\Omega$, $R_{sh} = 200\Omega$, No load current = 2A , Full load rated current = 20A. Find the efficiency at i) Full load ii) Half load. **(08 Marks)**

c. Derive an expression for the condition for maximum running torque of three Phase induction motor. **(06 Marks)**

OR

4 a. With neat circuit diagram, explain the steps involved to carry out Field test on D.C. Series motor. Discuss merits and demerits of the same. **(10 Marks)**

b. The following readings are obtained from Hopkinson's test. Find Motor and Generator efficiency separately.

Motor side → V = 220V, $I_a = 23A$ (motor) $I_{sh} = 0.3A$ (motor)

Generator → $I_a = 20A$ (generator) , $I_{sh} = 0.4A$ (Generator)

Armature resistance of each machine is 0.5Ω. **(10 Marks)**

Module-3

5 a. Draw the phasor diagram of induction motor on no load and on load, explain in detail. **(06 Marks)**

b. The power input of 400V, 50Hz , 6- pole three phase squirrel cage Induction motor runs at 975 RPM is 40 kW, the stator losses are 2kW, frictional and windage losses are 1.5kW. Find i) Rotor copper loss ii) BHP iii) Efficiency. **(06 Marks)**

c. With a neat circuit diagram, explain the necessity of conducting No – load and Blocked rotor tests on 3 – phase Induction motor. Also mention the mathematical relations. **(08 Marks)**

OR

6 a. Explain the Cogging and Crawling conditions in the induction motor. **(08 Marks)**

b. Write short notes on :

i) Double cage and deep rotor bars ii) Induction motor working as induction generator. **(12 Marks)**

Module-4

7 a. What is the necessity of starters in 3 – phase induction motors? With a neat circuit diagram, explain the operation of Star – delta starter. **(08 Marks)**

b. Explain the construction and working principle of shaded pole motor. **(08 Marks)**

c. List the various applications of single phase motors. **(04 Marks)**

OR

8 a. Describe the Double Field revolving theory and its Principle of operation. **(08 Marks)**

b. Give the construction and working principle, with a suitable sketches :

i) Capacitor start induction motor ii) Capacitor run motor. **(12 Marks)**

Module-5

9 Write short notes on :

a. Synchronous condenser.

b. Hunting and damping.

c. V and inverted V - curves.

d. Linear induction motor. **(20 Marks)**

OR

10 a. What is Stepper Motor? With a neat sketch, explain the construction and operation of variable reluctance type stepper motor. **(08 Marks)**

b. With a neat sketches, explain the construction and operation of universal motor. **(07 Marks)**

c. Write a note on AC servo motor. **(05 Marks)**

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CBCS SCHEME

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17EE45

Fourth Semester B.E. Degree Examination, Aug./Sept.2020

Electromagnetic Field Theory

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Given two vectors, $\vec{A} = \vec{a}_x + \vec{a}_y - 3\vec{a}_z$, $\vec{B} = 3\vec{a}_x - 2\vec{a}_y - 2\vec{a}_z$, find (i) $|2\vec{A} - \vec{B}|$ (ii) $|\vec{A}|(\vec{A} + \vec{B})$ (iii) Unit vector along $(2\vec{A} - \vec{B})$ **(08 Marks)**

b. Find the cross product of the two vectors $\vec{A} = 2\vec{a}_x - \vec{a}_y + 3\vec{a}_z$ and $\vec{B} = -5\vec{a}_x - 6\vec{a}_y + 7\vec{a}_z$ and then find the unit vector normal to $\vec{A}$ and $\vec{B}$. Also find the angle between $\vec{A}$ and $\vec{B}$. **(06 Marks)**

c. State Gauss's law. Determine the expression for electric field intensity at a distance 'r' from an infinite line charge using Gauss's law. **(06 Marks)**

OR

2 a. State and explain Coulomb's law in vector form. **(08 Marks)**

b. Given two points P(–3, 2, 1) and Q(r = 5, θ = 20°, ϕ = –70°), find:
(i) Spherical coordinates of P
(ii) Rectangular coordinates of Q
(iii) Distance from P to Q **(06 Marks)**

c. Determine:
(i) Gradient of the scalar field $u = \rho^2 z \cos 2\phi$
(ii) Divergence of the vector $\vec{A} = x^2 yz\,\vec{a}_x + xz\,\vec{a}_z$. **(06 Marks)**

Module-2

3 a. Find the energy stored in free space for the region $2\times10^{-3}\text{m} < r < 3\times10^{-3}\text{m}$, $0 < \theta < \frac{\pi}{2}$, $0 < \phi < \frac{\pi}{2}$ given the potential field V = 100/r Volts. **(08 Marks)**

b. Two point charges of –1nC and +1nC are located at A(–3, 1, 5) and B(6, –5, 2)m respectively. Find the electric potential at point P(3, –6, –9)m. **(06 Marks)**

c. Derive the boundary conditions between two dielectric materials. **(06 Marks)**

OR

4 a. Given $\vec{E}_1 = 2\vec{a}_x - 3\vec{a}_y + 5\vec{a}_z$ V/m at the charge free interface shown in Fig.Q4(a), find $\vec{D}_2$ and angles ϕ_1 and ϕ_2.

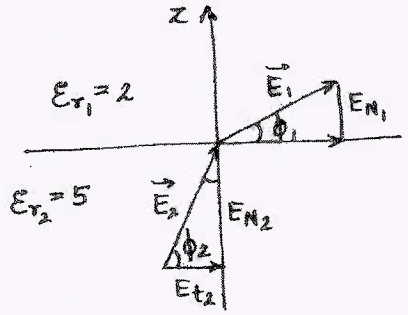

Fig.Q4(a) **(08 Marks)**

b. Derive an expression for the potential of a coaxial cable in the dielectric space between inner and outer conductors. **(06 Marks)**

c. Derive an expression for capacitance of a parallel plate capacitor with a dielectric interface parallel to the plates. **(06 Marks)**

Module-3

5 a. In spherical coordinates, V = 0 at r = 0.1 m and V = 100 V at r = 2m. Assuming free space between the concentric spherical shell, find $\vec{E}$ and $\vec{D}$. **(08 Marks)**

b. Write Laplace and Poisson's equations in all three coordinate systems. **(06 Marks)**

c. In cylindrical coordinate system, $\vec{H} = (4r - 2r^2)\vec{a}_\phi$ A/m, $0 \le r \le 1$. Find:

(i) $\vec{J}$ as a function of r within the cylinder, (ii) Total current that passes through the surface, $z = 0$ and $0 \le r \le 1$ m in $\vec{a}_z$ direction. **(06 Marks)**

OR

6 a. Find the potential and volume charge density at P(0.5, 1.5, 1)m in free space given the potential field as under, $V = 3x^2 - y^2 - z^2$ Volts. **(08 Marks)**

b. State and explain Biot-Savart's law. **(06 Marks)**

c. If $\vec{H} = 20\rho^2\vec{a}_\phi$ A/m, determine current density $\vec{J}$. **(06 Marks)**

Module-4

7 a. Derive boundary conditions at the boundary between two magnetic materials of different permeabilities. **(08 Marks)**

b. A point charge of Q = –20 μc is moving with a velocity of $\vec{V} = (-3\vec{a}_x - 4\vec{a}_y + 4.5\vec{a}_z) \times 10^6$ m/s. Find the magnitude of the vector force exerted on the moving particle by the field.

(i) $\vec{E} = \vec{a}_x + 1.5\vec{a}_y - 2\vec{a}_z$ kV/m (ii) $\vec{B} = 4\vec{a}_x - 6\vec{a}_y + 10\vec{a}_z$ mT. **(06 Marks)**

c. Obtain the relation between current density $\vec{J}$ and volume charge density ρ_v. **(06 Marks)**

OR

8 a. The z = 0 plane marks the boundary between two magnetic media. Medium-1 is the region $z > 0$ and medium 2 is the region $z < 0$. The magnetic flux density in medium-1 is $\vec{B}_1 = 1.5\vec{a}_x + 0.8\vec{a}_y + 0.6\vec{a}_z$ mT. Find the magnetic flux density of medium-2. Assume medium-1 as free space and relative permeability of medium-2 as 100. **(08 Marks)**

b. Derive the expression for self inductance of a coaxial cable. **(06 Marks)**

c. Calculate the inductance of 10m long coaxial cable filled with material for which $\varepsilon_r = 18$, $\sigma = 0$, $\mu_r = 80$. The external and internal diameters of the cable are 1 mm and 4 mm respectively. **(06 Marks)**

Module-5

9 a. Explain skin effect and skin depth. Derive the expression for skin depth. **(08 Marks)**

b. List Maxwell's equations for time-varying fields in point form and integral form. **(06 Marks)**

c. Starting from Ampere's circuital law, derive an expression for displacement current density for time varying fields. **(06 Marks)**

OR

10 a. A uniform plane wave with 10 mHz frequency has average Poynting vector of 1 W/m^2. If the medium is a perfect dielectric with $\mu_r = 2$, $\varepsilon_r = 3$, find:
(i) velocity (ii) wavelength (iii) intrinsic impedance. **(08 Marks)**

b. A short vertical transmitting antenna erected on the surface of a conducting earth produces $E_{effective} = 150 \sin \theta$ V/m at points at a distance of 2 kms from the antenna. Compute the Poynting vector. **(06 Marks)**

c. A 10 giga Hz uniform plane wave travelling in free space in x-direction has $E_z = 1$ V/m. Find the value of magnetic field and propagation constant. **(06 Marks)**

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CBCS SCHEME

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17EE46

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Operational Amplifiers and Linear ICs

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Draw the block diagram of an op-amp and explain. **(10 Marks)**

b. Sketch the 3-input non-inverting summing amplifier circuit. Explain the operation of the circuit and derive an equation for the output voltage. Also explain how to convert it to an adder and averaging amplifier. **(10 Marks)**

OR

2 a. List the ideal characteristics of an op-amp (any six). **(06 Marks)**

b. Mention the advantages of using negative feedback in op-amps (any 4). **(04 Marks)**

c. What is an instrumentation amplifier? Obtain an expression for output voltage V_0, in terms of change in resistance ΔR of an instrumentation amplifier using transducer bridge. **(10 Marks)**

Module-2

3 a. With a neat circuit diagram, explain the working of 1st order low pass filter and draw its typical frequency response curve. **(10 Marks)**

b. Design a set adjustable positive voltage regulator using IC LM317 for the output voltage of 5 V. **(04 Marks)**

c. Mention the advantages of active filter over passive filters. (any six) **(06 Marks)**

OR

4 a. Draw the circuit of a adjustable voltage regulator and explain its operation. **(10 Marks)**

b. Design a second order low pass filter for a cut-off frequency of 1 kHz. Also draw the circuit diagram and mention the component values. **(06 Marks)**

c. Design a narrow band pass filter for the following specifications, centre frequency 1.5 kHz, Q-factor is 7, gain at f_C is 15. **(04 Marks)**

Module-3

5 a. With a neat circuit diagram, explain the working of triangular / rectangular wave generator. **(10 Marks)**

b. With a neat circuit diagram and waveform explain the working of inverting Zero Cross over Detector (ZCD). **(10 Marks)**

OR

6 a. With a neat circuit diagram and necessary derivation for load current, explain voltage to current converter with grounded load. **(10 Marks)**

b. Design a RC-phase shift oscillator using op-amp for a frequency of 500 Hz. Also draw the circuit diagram and name the component values take C = 0.1 μF **(06 Marks)**

c. Define the working principle of voltage to frequency (V/F) converter and mention its applications (any 4). **(04 Marks)**

Module-4

7 a. With a neat circuit diagram and waveform explain the working of precision Full Wave rectifier. **(10 Marks)**

b. With a neat circuit diagram, explain the working of successive approximation type ADC. **(10 Marks)**

OR

8 a. Explain the operation of R-2R ladder digital to analog converter circuit. **(10 Marks)**

b. Design a non-saturating precision half wave rectifier to produce a 2 V peak output from a 1 MHz sine wave input with a 0.5 V peak value. Use Bi-polar op-amp with a supply voltage of $\pm 15V$. **(10 Marks)**

Module-5

9 a. With a neat block diagram, explain phase locked loop in detail. **(10 Marks)**

b. Draw the pin diagram of 555IC timer and mention its pin functions. **(05 Marks)**

c. Design a monostable multivibrator using IC 555 timer to obtain a pulse width of 10 msec. **(05 Marks)**

OR

10 a. With a neat diagram, explain the internal architecture of IC555 timer. **(10 Marks)**

b. Define the following terms related to PLL:

(i) Lock range.
(ii) Capture range.
(iii) Pull in time
(iv) Tracking range. **(08 Marks)**

c. Mention the applications of IC555 timer (any 4). **(02 Marks)**

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CBCS SCHEME

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15EE43

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Transmission and Distribution

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive an expression for SAG of a line conductor suspended between unequal level supports taking into the effect of Ice and wind loading. **(08 Marks)**

b. A transmission line has a span of 150m between level supports. The conductor has a cross sectional area of $2cm^2$. The tension in the conductor is 2000kg. If the specific gravity of the conductor material is $9.9gm/cm^3$ sag. What is the vertical sag? **(08 Marks)**

OR

2 a. Explain the different methods of improving the string efficiency of Insulator for equal voltage distribution. **(08 Marks)**

b. In a 33kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self capacitance of each insulator, find the distribution of voltage over 3 insulators and string efficiency. **(08 Marks)**

Module-2

3 a. Derive the expression for Inductance of a 3Q symmetrically spaced transmission line. **(08 Marks)**

b. Fig.Q.3(b), shows the spacing's of a double circuit 3-phase over head line. The phase sequence is ABC and the line is completely transposed. The conductor radius is 1.3cm, find the inductance per phase per kilometer.

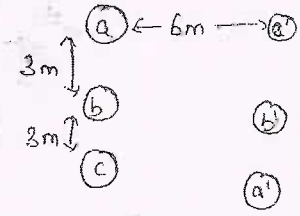

Fig.Q.3(b)

(08 Marks)

OR

4 a. Derive the expression for capacitance of a transposed 3-phase line with unsymmetrical spacing. **(08 Marks)**

b. A 3 phase, 50Hz 66kV overhead line conductor are placed in a horizontal plane as shown in Fig.Q.4(b). The conductor diameter is 1.25cm. If the line length is 100km. Calculate:

i) Capacitance per phase

ii) Charging current per phase, assuming complete transposition of the line. **(08 Marks)**

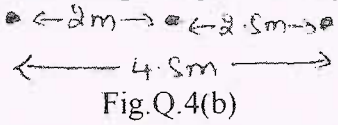

Fig.Q.4(b)

Module-3

5 a. Obtain expression for sending end voltage and current in terms of ABCD constants and receiving end voltage and current for a nominal - π model of a transmission line. Also draw the phasor diagram. **(08 Marks)**

b. A balanced 3Q load of 30MW is supplied at 132kV 50Hz and 0.8pf lagging by Mean's of a transmission line. The serial impedance of a single conductor is $(20 + j52)\Omega$ and the total phase-neutral admittance is 315×10^{-6} siemen using nominal T-method determine
i) A, B, C, D constants ii) Sending end voltage iii) Regulation of the line. **(08 Marks)**

OR

6 a. Deduce an expression for transmission efficiency and regulation for medium transmission line using nominal 'T' method. **(08 Marks)**

b. A short 3-ϕ transmission line with an Impedance of $(6 + j8)\ \Omega$ per phase has sending and receiving end voltages of 120kV and 110kV respectively for some receiving end load at a p.f of 0.9 lagging. Determine: i) Power output ii) Sending end power factor. **(08 Marks)**

Module-4

7 a. What is Corona? What are the factors which affect Corona? **(05 Marks)**

b. Describe the various methods for reducing Corona effect in an overhead transmission line. **(02 Marks)**

c. Explain the following terms with reference to Corona:
i) Critical disruptive voltage
ii) Visual critical voltage
iii) Power loss due to Corona. **(09 Marks)**

OR

8 a. With a neat diagram, show the various parts of a high voltage single-core cable. **(04 Marks)**

b. Deduce an expression for the capacitance of a single-core cable. **(05 Marks)**

c. Calculate the capacitance and charging current of a single core cable used on a 3 phase, 66kV system. The cable is 1km long having a core diameter of 10cm and an impregnated paper insulation of thickness 7cm. The relative permittivity of the insulation may be taken as 4 and the supply at 50Hz. **(07 Marks)**

Module-5

9 a. Describe briefly how will you solve A.C. distribution problem. **(06 Marks)**

b. A single phase distributor 2km long supplies a load of 120A at 0.8pf lagging at its far end and a load of 80A at 0.9pf lagging at its mid point. Both p.f. are referred to the voltage at the far end. The resistance and reactance per km are 0.05Ω and 0.1Ω respectively. If the voltage at the far end is maintained at 230V. Calculate: i) Voltage at the sending end ii) Phase angle between voltage at the two ends. **(10 Marks)**

OR

10 a. What is reliability? What are the limitations of distribution system? **(06 Marks)**

b. A 3 phase, 4 wire distributor supplies a balanced voltage of 400/230V to a load consisting of
30A at p.f. 0.866 lagging for R-phase
30A at p.f. 0.866 leading for Y-phase
30A at p.f. unity leading for B-phase
The resistance of each line conductor is 0.2Ω. The area of X-section of neutral is half of any line conductor. Calculate the supply end voltage for R-phase the phase sequence Ry13. **(10 Marks)**

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CBCS SCHEME

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15EE44

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Electric Motors

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the speed-current, torque-current and speed torque characteristics of DC shunt motor. **(06 Marks)**

b. Derive the expression for the torque developed in a DC motor. **(04 Marks)**

c. A 200V shunt motor has $R_a = 0.1\Omega$, $R_f = 240\Omega$ and rotational loss 236watt. On full load, the line current is 9.8A with the motor running at 1450 rpm. Determine:
i) The mechanical power developed
ii) The load torque
iii) The full load efficiency **(06 Marks)**

OR

2 a. Explain with a neat diagram the operation of a 3 point starter. **(07 Marks)**

b. What are the different losses in dc shunt motor? how do they vary with the load. **(04 Marks)**

c. A 230V DC shunt motor runs at 800rpm and takes an armature current of 50A. Find the resistance to be added to the field circuit to increase the speed from 800rpm to 1000rpm at an armature current of 80A. Assume that flux is proportional to field current. Take $R_a = 0.15\Omega$ and $R_{sh} = 250\Omega$. **(05 Marks)**

Module-2

3 a. Explain with a neat circuit Field's test conducted on two similar DC series motor. **(06 Marks)**

b. Sketch the torque-slip characteristic of a 3 phase Induction motor indicating herein the starting torque, maximum torque and operating region. **(04 Marks)**

c. Derive the expression for the torque of an Induction motor and obtain the condition for maximum torque. **(06 Marks)**

OR

4 a. A retardation test in performed on a separately excited DC motor. The induced voltage falls from 240V to 220V in 25 secs, on opening the armature circuit and in 6 seconds on suddenly changing the armature connection from supply to a load resistance, which takes an average current of 10A. Find the efficiency of the machine running as a motor taking a current of 25A from 250V supply. Take $R_a = 0.3\Omega$ and $R_{sh} = 200\Omega$. **(06 Marks)**

b. An 8 pole, 50Hz, 3 phase Induction motor develops a maximum torque of 150Nm at 650rpm. The rotor resistance is 0.6Ω/ph. Find torque at 4% slip. Neglect stator impedance. **(04 Marks)**

c. Describe the relative merits and demerits of Swinburne's test. Why this test cannot be performed on DC series motor. **(06 Marks)**

Module-3

5 a. Draw and explain the phasor diagram and equivalent circuit of a 3 phase Induction motor. **(08 Marks)**

b. A 6 pole, 50Hz, 3 phase Induction motor running on full load with 4% slip develops a torque of 149.3Nm, at its pulley rim. The friction and windage losses are 200W and stator copper and iron losses equal to 1620watts. Calculate:

i) Output power
ii) Gross torque
iii) The rotor copper losses
iv) The efficiency at full load. **(08 Marks)**

OR

6 a. A 400V, 3 phase, 50Hz, star connected Induction motor has the following test results:
No-load test : 400V, 8.5A, 1100W
Blocked rotor test : 180V, 45A, 5700W
Calculate the line current and power factor when operating at 4% slip by drawing circle diagram. The stator resistance/ph is 0.5Ω. **(10 Marks)**

b. Explain how voltage is induced in Induction generator. **(06 Marks)**

Module-4

7 a. With the help of a neat sketch explain the working of star-delta starter. **(06 Marks)**

b. With connection diagram, explain working of single phase capacitor start Induction motor. **(06 Marks)**

c. Explain rotor resistance control method of 3 phase induction motor speed control with a suitable diagram. **(04 Marks)**

OR

8 a. Why single phase Induction motor is not self starting? Explain the double revolving field theory. **(08 Marks)**

b. Why starters are required for 3ph Induction motor? Explain with necessary circuit direct on-line starter. **(08 Marks)**

Module-5

9 a. Why the synchronous motor is not self starting? Explain the following starting methods.

i) Auxiliary motor starting
ii) Induction motor starting. **(08 Marks)**

b. List out the reasons why AC servomotors are best suited for low power applications. **(04 Marks)**

c. A 400V, 10HP, 3 phase synchronous motor has negligible armature resistance and synchronous reactance of 10Ω/phase. Determine the minimum current and the corresponding induced EMF for full load condition. Assume an efficiency of 85%. **(04 Marks)**

OR

10 a. Explain the effect of varying excitation on armature current and p.f. of synchronous motor. **(08 Marks)**

b. Explain with a neat diagram principle of operation of stepper motor. **(08 Marks)**

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CBCS SCHEME

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15EE45

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Electromagnetic Field Theory

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. State and explain Coulomb's law in vector form. **(05 Marks)**

b. Find the divergence and curl of the following vector fields.

i) $\bar{A} = 30\bar{a}_x + 2xy\,\bar{a}_y + 5xz^2\,\bar{a}_z$

ii) $\bar{A} = \left(\frac{150}{r^2}\right)\bar{a}_r + 10\bar{a}_\phi$ (Cylindrical coordinates). **(06 Marks)**

c. A line charge density 24 nc/m is located in free space on the line y = 1, z = 2.

i) Find $\bar{E}$ at P(6, −1, 3)

ii) What point charge Q_A should be located at A(−3, 4, 1) to cause E_y to be equal to zero at P. **(05 Marks)**

OR

2 a. Derive an expression for electric filed due to an infinite line charge with density of ρ_L c/m placed along z−axis, using Gauss's law. **(06 Marks)**

b. Find electric flux density at point P(1, 2, 4) due to a point charge of 6 μC is located at origin, a uniform line charge density of 180 nc/m lies along the x−axis and a uniform sheet of charge equal to 25 nc/m^2 lies in the z = 0 plane. **(06 Marks)**

c. A vector filed $D = \left(\frac{5r^2}{4}\right)\bar{a}_r$ is given in spherical coordinates. Evaluate both sides of Divergence theorem for the volume enclosed between $Q = \frac{\pi}{4}$ and r = 4. **(04 Marks)**

Module-2

3 a. Derive an expression for energy expanded in moving a point charge in an electric fields. **(06 Marks)**

b. Electric field intensity in a perfect dielectric medium is given by $\bar{E} = 4y\,\bar{a}_x + 4x\,\bar{a}_y$ V/m. Find the potential difference between the points A(−1, 4, 0)m and B(1, 2, 0)m along the freight line path. **(04 Marks)**

c. An electric potential is given by $V = x^3y - xy^2 + 3z$ volts. Find :

i) V ii) $\bar{E}$ iii) $\bar{D}$ and iv) ρ_V at point P(1, 1, 1). **(06 Marks)**

OR

4 a. Starting from principle of charge conservation obtain the point form of continuity equation. **(06 Marks)**

b. Determine an equation for the capacitance of coaxial cable of length 'L', radius of inner conductor is 'a' and outer conductor is 'b'. **(06 Marks)**

c. The region $y < 0$ contains a dielectric material for which $\in_{r_1} = 2$ and the region $y > 0$ contains a dielectric material for which $\in_{r_2} = 4$. If $\overline{E}_1 = -3\overline{a}_x + 5\overline{a}_y + 7\overline{a}_z$ V/m, find the $\overline{E}_2$ and $\overline{D}_2$ in medium 2. **(04 Marks)**

Module-3

5 a. Starting from the point form of Gauss's law, derive the Poisson's and Laplace's equation. **(06 Marks)**

b. Find the potential and electric filed intensity for the region between two concentric right circular cylinders, where V = 0 at r = 1mm and V = 100 volts at r = 20mm. **(06 Marks)**

c. A current element of 0.05 $\overline{a}_x$ A-m is located P(0, 0,1)m in rectangular coordinates. Find the magnetic field intensity of A(2, 3, −1.2). **(04 Marks)**

OR

6 a. State and explain Ampere's circuital law. **(06 Marks)**

b. Explain vector magnetic potential. **(04 Marks)**

c. The magnetic field intensity in the region of the rectangle as shown in Fig Q6(c), is given by $H = y^2\,\overline{a}_x + 3x\,\overline{a}_y$ A/m. verify Stoke's theorem.

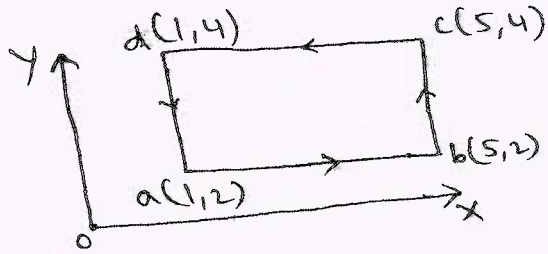

Fig Q6(c) **(06 Marks)**

Module-4

7 a. Derive an expression for the force on a differential current element placed in a magnetic field. **(06 Marks)**

b. In a certain region of space, B is given by $0.1x\,\overline{a}_x + 0.2y\,\overline{a}_y - 0.3z\,\overline{a}_z$ T. Find the total force on the rectangular loop shown in Fig Q7(b), if it lies in the z = 0 plane and is bounded by x = 1, x = 3, y = 2 and y = 5m.

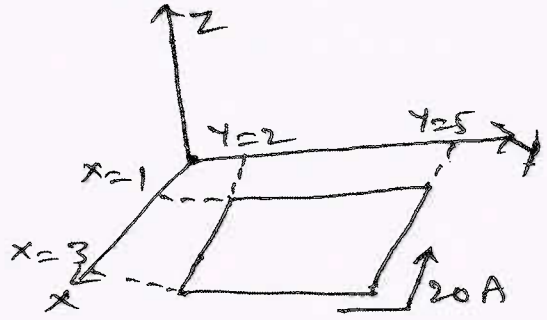

Fig Q7(b) **(10 Marks)**

OR

8 a. Derive the magnetic boundary conditions at the interface between the two different magnetic materials. **(08 Marks)**

b. Calculate the inductance of a solenoid of 400 turns wound on a cylindrical tube of 10cm diameter and 50cm length. Assume that solenoid is in air. **(06 Marks)**

c. Define self inductance. **(02 Marks)**

Module-5

9 a. List the Maxwell's equations in integral and point form for time varying fields. **(08 Marks)**

b. What is the drawback of Ampere's circuital law? Derive the modified form of Ampere's circulator law to suit the time varying fields. **(08 Marks)**

OR

10 a. Obtain the solution of wave equation for uniform plane wave propagating in free space. **(10 Marks)**

b. A 10GHz plane wave travelling in free space has an amplitude of $\overline{E}$ as $E_x = 10V/m$. Find β, η, v, λ and amplitude, direction of $\overline{H}$. **(06 Marks)**

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CBCS SCHEME

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15EE46

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Operational Amplifiers and Linear IC's

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Draw the block diagram of op-amp and explain. **(08 Marks)**

b. The 741 op-amp having following paremeters is connected as a non-inverting amplifier with $R_1 = 1k\Omega$, $R_F = 10k\Omega$, $A = 200000$, $R_i = 2M\Omega$, $R_0 = 75\Omega$, $f_0 = 5KHz$, supply voltages $\pm 15V$ output voltage swing = $\pm 13V$. Calculate values of A_F, R_{iF}, R_{0F}, f_F and Vo_{0F}. Draw the circuit. **(08 Marks)**

OR

2 a. Derive the closed loop voltage gain equation for voltage series feedback amplifier. **(08 Marks)**

b. Explain with neat circuit diagram :
i) Peaking amplifier
ii) AC non-inverting amplifier. **(08 Marks)**

Module-2

3 a. Design second order low pass filter at a high cut off frequency of 1KHz. Draw the circuit. **(08 Marks)**

b. Explain the terms with respect to voltage regulator. i) Source effect ii) Load effect. **(04 Marks)**

c. An LM317 regulator is to provide a 6V output from a 15V supply. The load current is 200mA. Determine suitable resistance values of R_1 and R_2. **(04 Marks)**

OR

4 a. Explain with neat circuit diagram Wide-band-pass filter. **(08 Marks)**

b. An unregulated DC power supply output changes from 20V to 19.7V. when the load is increased from zero to maximum. The voltage also increases to 20.2V. When AC supply increases by 10%. Calculate load and source effects and load and line regulations. **(08 Marks)**

Module-3

5 a. Design RC phase shift oscillator for $f_0 = 200Hz$ using 741. Draw neat circuit diagram and output waveforms. **(08 Marks)**

b. Explain with neat diagram SCHMITT Trigger circuit and also draw wave forms. **(08 Marks)**

OR

6 a. Explain with necessary circuit and waveforms triangular wave generator using op-amp. **(08 Marks)**

b. Explain voltage to frequency converter using single variable supply voltage with offset and gain adjust using 9400. **(08 Marks)**

Module-4

7 a. Explain with neat circuit diagram and wave forms sample and hold circuit using 741. **(08 Marks)**

b. Explain in detail successive approximation ADC analog to digital converter. **(08 Marks)**

OR

8 a. Explain with neat circuit and waveforms positive clamper and negative clamper using op-amp. **(08 Marks)**

b. Explain in detail R to 2R D/A converter. **(08 Marks)**

Module-5

9 a. Explain with block diagram phase locked loop. **(08 Marks)**

b. Explain Astable multivibrator circuit operation using op-amp. **(08 Marks)**

OR

10 a. Explain the following terms with respect to PLL
   i) Loop gain
   ii) Tracking range
   iii) Capture range. **(08 Marks)**

b. Explain function of various pins of IC555 timer. **(08 Marks)**

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CBCS SCHEME

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15EE32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. For the network K shown in Fig Q1(a) find potential between M and N using source transformation. **(04 Marks)**

b. Using Mesh current Analysis determine V_x and power supplied by 10 volt source of the network shown in Fig Q1(b). **(06 Marks)**

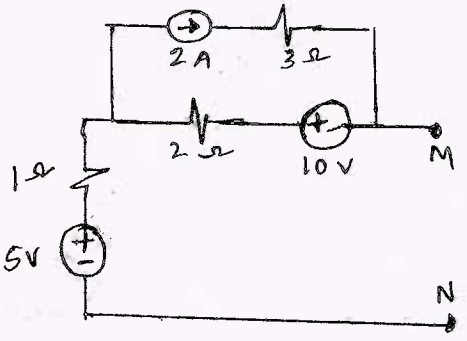

Fig Q1(a)

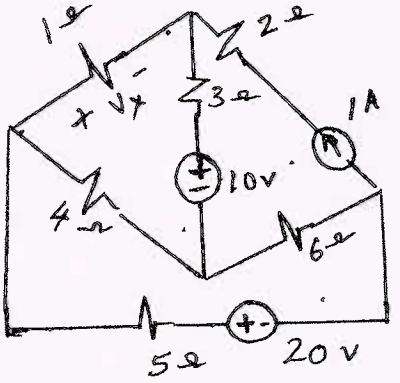

Fig Q1(b)

c. What is Resonance? Show that the resonant frequency in geometric mean of cut off frequencies. **(06 Marks)**

OR

2 a. For the circuit shown in Fig Q2(a), final the resistance between M and N using Star/Delta transformation. **(05 Marks)**

b. Using Node voltage analysis, find V_x and I_x. of the circuit shown in Fig Q2(b) **(06 Marks)**

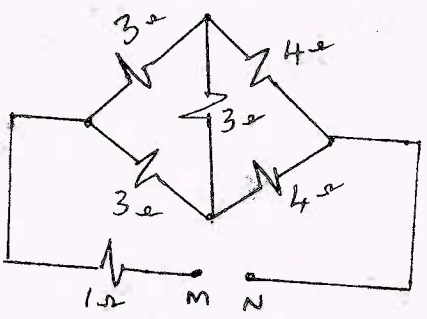

Fig Q2(a)

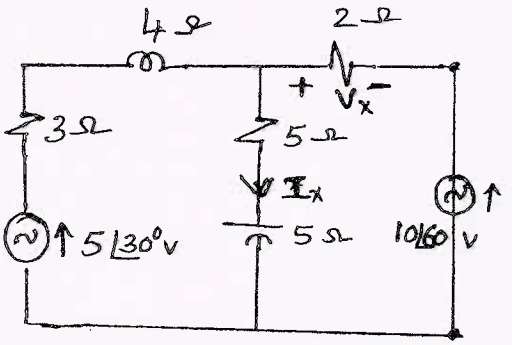

Fig Q2(b)

c. A coil of 20Ω resistance was in inductance of 0.2 henery and is connected in parallel with capacitance of 100μF. Find the resonant frequency at which circuit will act as non inductive resistance, Also find the dynamic resistance. **(05 Marks)**

Module-2

3 a. State and prove Reciprocity theorem. **(05 Marks)**

b. For the network shown in Fig Q3(b), find current I using Milliman's theorem. **(05 Marks)**

c. For the network shown in Fig Q3(c), find current I using Norton's theorem. **(06 Marks)**

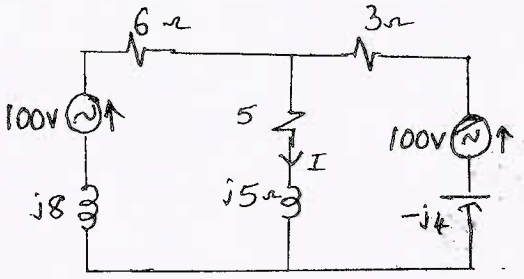

Fig Q3(b)

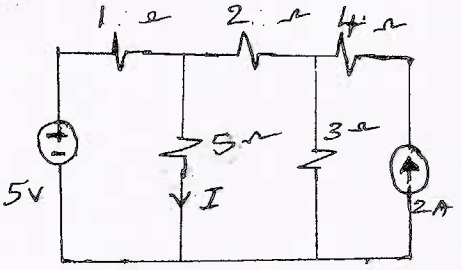

Fig Q3(c)

OR

4 a. Draw the Thevenin's equivalent circuit of Fig shown in Fig Q4(a). **(05 Marks)**

b. For the network shown in Fig Q4(b), find the current 'I_x' using superposition theorem. **(05 Marks)**

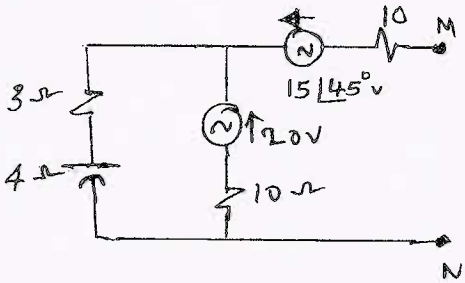

Fig Q4(a)

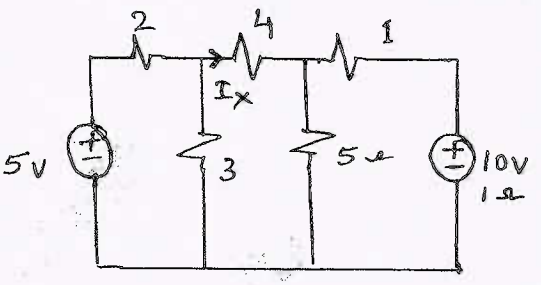

Fig Q4(b)

c. State and obtain the condition for maximum power transfer when load consisting of variable resistance and variable reactance. **(06 Marks)**

Module-3

5 a. Explain the behavior of Resistance, inductance and capacitance for initial condition. **(05 Marks)**

b. For the network shown in Fig Q5(b), switch is closed at t = 0. Write expression for current i(t) for t > 0. **(06 Marks)**

c. For the circuit shown in Fig Q5(c), switch is closed at t = 0. Obtain expression for current i(t) for t > 0. **(05 Marks)**

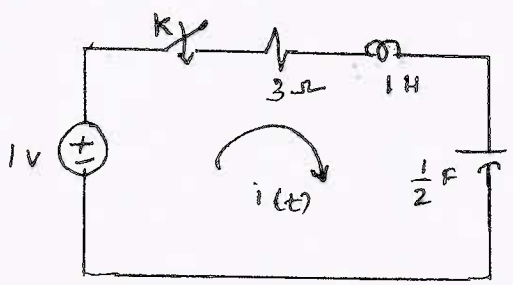

Fig Q5(b)

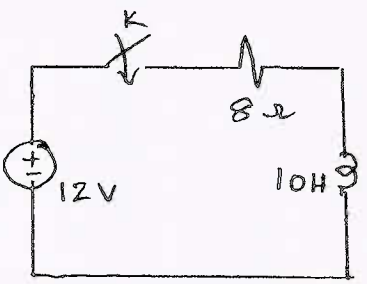

Fig Q5(c)

OR

6 a. Define initial condition and final condition and list merits of initial conditions. **(04 Marks)**

b. For the network shown in Fig Q6(b) switch is changed from M to N at t = 0 after reaching steady state condition. Find current i(t) and its derivatives at $t = 0^+$. **(06 Marks)**

c. For the network shown in Fig Q6(c) switch is opened at t = 0. Find voltage v(t) and its first and second derivatives at $t = 0^+$. **(06 Marks)**

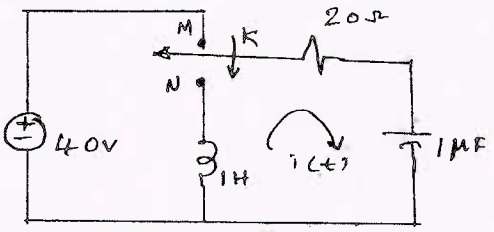

Fig Q6(b)

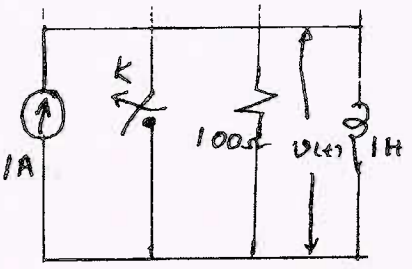

Fig Q6(c)

Module-4

7 a. State and explain Final value theorem. **(05 Marks)**

b. If the capacitors are uncharged and the inductor current is zero at $t = 0^-$, in the given network shown in Fig Q7(b). Show that the transform of the generator current is

$$\frac{10(s^2+s+1)}{(s^2+1)(s^2+2s+2)}$$

(05 Marks)

c. Synthesis the waveform shown in Fig Q7(c) and find the Laplace transform. **(06 Marks)**

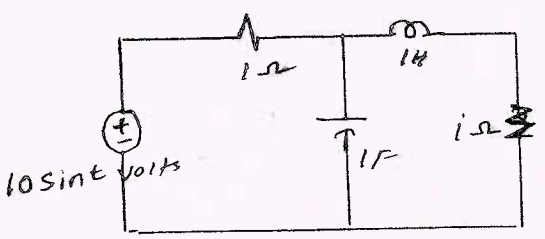

Fig Q7(b)

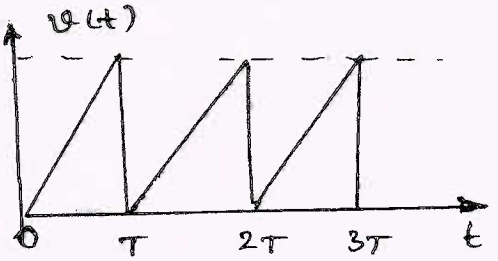

Fig Q7(c)

OR

8 a. Find the Laplace transform of following standard signal. i) Unit step ii) Ramp iii) Impulse **(05 Marks)**

b. Let $I(s) = \frac{2s+5}{(s+1)(s+2)}$. Find its initial value using initial value theorem. Verify the result. **(04 Marks)**

c. For the network shown in Fig Q8(c) at t = 0 switch is opened. Find node voltage $v_1(t)$ and $v_2(t)$. The network is under steady state condition when the switch is closed. **(07 Marks)**

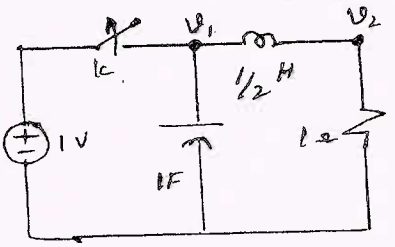

Fig Q8(c)

Module-5

9 a. Determine the line currents and total power supplied to a Delta connected load of $Z_{AB} = 10\angle 60$, $Z_{BC} = 20\angle 90$ and $Z_{CA} = 25\angle 30°\Omega$. Assume a 3 phase 400V and ABC sequence. **(06 Marks)**

b. For the network shown in Fig Q9(b), obtain the z - parameters. **(06 Marks)**

c. Obtain driving point impedance and driving point admittance of one port network shown in Fig Q9(c). **(04 Marks)**

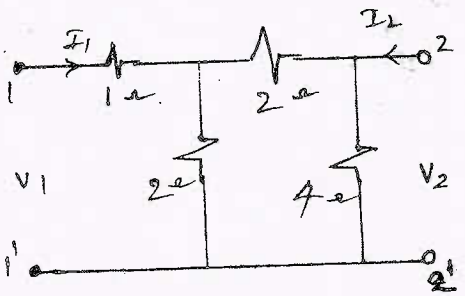

Fig Q9(b)

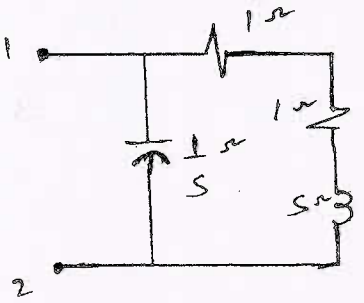

Fig Q9(c)

OR

10 a. Obtain y-parameters interms of z-parameters. **(06 Marks)**

b. A voltage pulse of 10V magnitude is applied to the network shown in Fig Q10(b). Find the current i(t). **(06 Marks)**

c. Determine the system function if the d.c gain of the system is 10 and pole zero plot is as shown in the Fig Q10(c). **(04 Marks)**

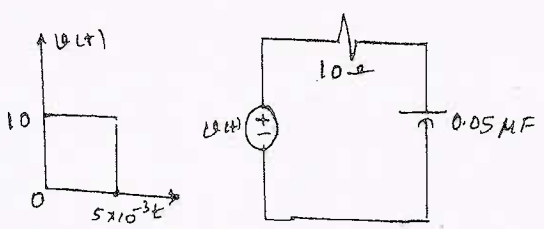

Fig Q10(b)

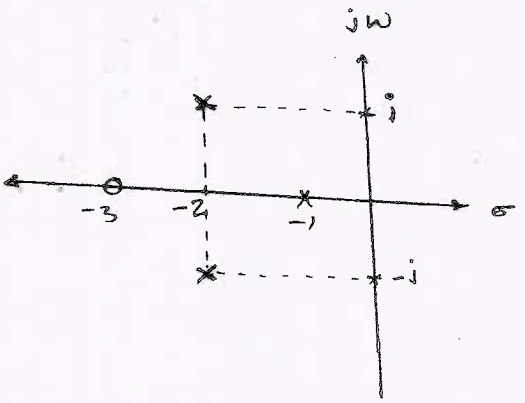

Fig Q10(c)

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CBCS SCHEME

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15EE33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data if any.

Module-1

1 a. Derive an equivalent circuit of a single phase transformer and show that the parameters of the primary and secondary winding may be combined to give a simplified equivalent circuit referred to primary side. **(08 Marks)**

b. A 3ϕ transformer of ratio 33/6.6KV delta/star 2MVA has a primary resistance of 8Ω per phase and a secondary resistance of 0.08 per phase. The percentage of impedance is 7% calculate the secondary load voltage with rated primary voltage and hence the regulation for full load 0.75p.f. lagging condition. **(08 Marks)**

OR

2 a. The following readings are obtained from O.C. and S.C tests on 8KVA 400/120V, 50Hz transformer.
O.C test (L.V side) : 120V ; 4A ; 75W
S.C test (H.V side) : 9.5V ; 20A ; 110W
Calculate:
i) The equivalent circuit constants.
ii) Voltage regulation and efficiency for 0.8 lagging power factor full load.
iii) The efficiency at half load and 0.8 p.f. load. **(08 Marks)**

b. Explain with the help of connection and phasor diagrams how Scott connections are used to obtain two phase supply from three phase supply mains. **(08 Marks)**

Module-2

3 a. What are the conditions necessary for satisfactory parallel operation? **(04 Marks)**

b. What are the advantages of the Sumpner's test? **(04 Marks)**

c. Two 250KVA transformers supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are the same. The resistance drops are 1.5% and 0.9% and the reactance drops are 3.33% and 4% respectively. Calculate the KVA loading on each transformer and its power factor when the total load on the transformers is 500KVA and at 0.707 lagging power factor. **(08 Marks)**

OR

4 a. Derive an expression for the currents shared by between two transformers connected in parallel supplying a common load when no load voltages of these transformers are unequal. **(08 Marks)**

b. Write a brief note on:
i) Polarity test
ii) On load tap changing of transformer. **(08 Marks)**

Module-3

5 a. What is armature reaction? With neat figures explain armature reaction in D.C. machine under normal working condition. **(08 Marks)**

b. A 3ϕ star connected alternator on open circuit is required to generate a line voltage of 3.4KV, 50Hz. When driven at 500rpm. The stator has 3 slots/pole/phase and 10 conductors/slot. The coils are short chorded by 1 slot. Calculate the number of poles and useful flux/pole. **(08 Marks)**

OR

6 a. Derive the Emf equation of a synchronous generator. Define distribution factor and pitch factor. **(08 Marks)**

b. An 8 pole wave wound d.c. generator has 480 armature conductors. The armature current is 200A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole, if

i) Brushes are on G.N.A.

ii) Brushes are shifted 6° electrical from G.N.A. **(08 Marks)**

Module-4

7 a. With a neat phasor diagram derive an expression for the power output of a salient pole alternator. Draw the variation of power, V_s, load angle δ. **(08 Marks)**

b. Explain the behavior of synchronous generator on no load under variable excitation connected to infinite bus bar. **(08 Marks)**

OR

8 a. Two 6600 volt, star connected alternators operating in parallel supply with the following loads:

i) 400kW at UPF

ii) 1000kW at 0.71 p.f. lag

iii) 400kW at 0.8 p.f lag

iv) 300kW at 0.9 p.f lag.

The armature current of one machine is 110A, at a p.f. of 0.9 lag. Find the output armature current and p.f. of the other machine. **(08 Marks)**

b. What is synchronizing of alternators? What are the conditions for proper synchronization of alternators? How three phase alternators are synchronized? **(08 Marks)**

Module-5

9 a. Describe the synchronous impedance method to determine regulation of an alternator for lagging and leading power factor. **(10 Marks)**

b. Define short circuit ratio and explain its significance. **(06 Marks)**

OR

10 a. Define regulation of an alternator. Explain the potier reactance method of finding regulation of an alternator. **(10 Marks)**

b. A 2300V, 50Hz, 3ϕ star connected alternator has an effective armature resistance of 0.2Ω. A field current of 35A produces a current of 150A on short circuit and an open circuit emf 780V (line). Calculate the voltage regulation at 0.8pf. lagging and 0.8 p.f. leading for the full load current of 25A. **(06 Marks)**

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