CBCS SCHEME

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17EE32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Find an equivalent resistance between A and B for the network given in Fig. Q1 (a) using star-delta transformation. **(06 Marks)**

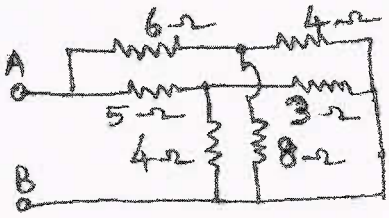

Fig. Q1 (a)

b. Find the currents i_1, i_2 and i_3 in the network given in Fig.Q1 (b) using mesh analysis. **(06 Marks)**

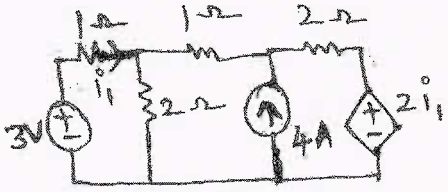

Fig. Q1 (b)

c. Find the power dissipated in 10 Ω resistor by nodal analysis in Fig. Q1 (c). **(08 Marks)**

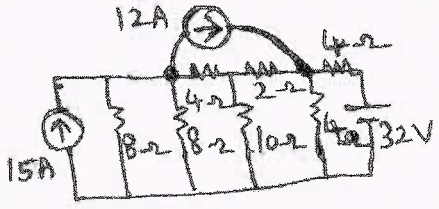

Fig. Q1 (c)

OR

2 a. Distinguish between (i) Active and Passive elements (ii) Ideal and practical sources. **(04 Marks)**

b. Find the node voltage V_1, V_2 and V_3 in the circuit diagram shown in Fig. Q2 (b) using nodal analysis. **(08 Marks)**

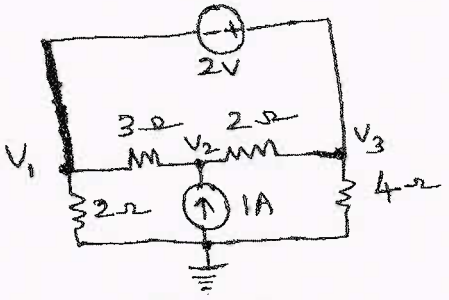

Fig. Q2 (b)

c. Find the current i_a in the circuit given in Fig. Q2 (c) using mesh analysis. **(08 Marks)**

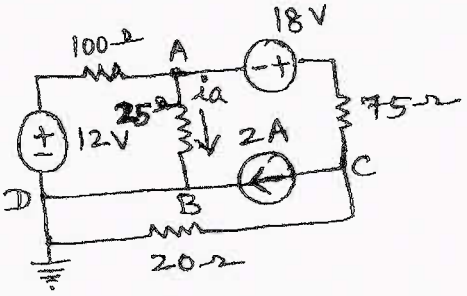

Fig. Q2 (c)

Module-2

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

b. Find the Thevenin's voltage, short circuit current and determine the actual current flowing through the 6 Ω resistor in the network given in Fig. Q3 (b). **(07 Marks)**

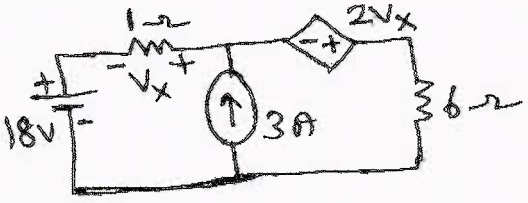

Fig. Q3 (b)

c. Find the current through 16 Ω resistor in the network given in Fig. Q3 (c) using Norton's theorem. **(07 Marks)**

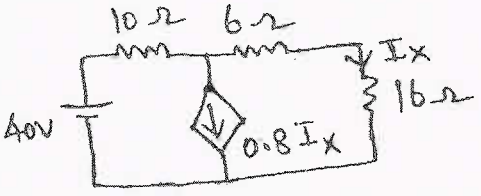

Fig. Q3 (c)

OR

4 a. Verify the reciprocity theorem for the voltage V and current I in the network given in Fig. Q4 (a). **(08 Marks)**

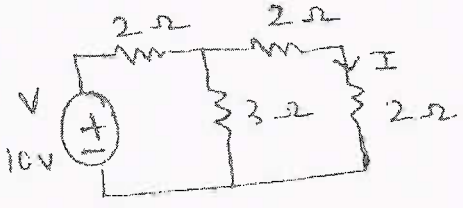

Fig. Q4 (a)

b. Find the value of load resistance R_L when maximum power is transferred across it in the network shown in Fig. Q4 (b). **(04 Marks)**

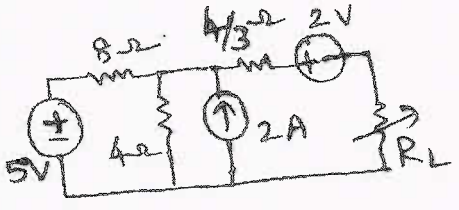

Fig. Q4 (b)

c. Find the current through R_L using Thevenin's theorem for the network in the Fig. Q4 (c). **(08 Marks)**

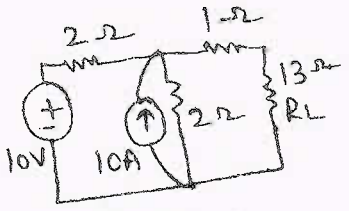

Fig. Q4 (c)

Module-3

5 a. Derive expression for resonant frequency in series RLC circuit. **(06 Marks)**

b. A series RLC circuit has R = 4 Ω, L = 1 mH and C = 10 μF. Calculate Q factor, bandwidth, resonant frequency and half power frequencies. **(08 Marks)**

c. Find the equation of current if the switch is closed at t = 0. Find also the voltage across L and R, the current at t = 0.1 sec and the time at which the voltage across L and R are equal in the Fig. Q5 (c). **(06 Marks)**

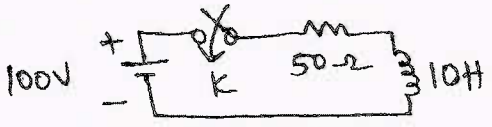

Fig. Q5 (c)

OR

6 a. Find I_0, I_C, I_L, Q factor, resonant frequency and parallel resonance for the parallel resonant circuit shown in Fig. Q6 (a). **(08 Marks)**

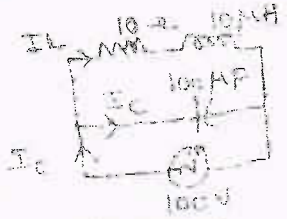

Fig. Q6 (a)

b. In the Fig. Q6 (b), the switch S is closed at t = 0, find the time when the current from the battery reaches to 500 mA. **(08 Marks)**

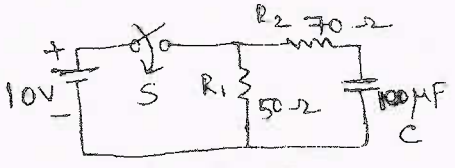

Fig. Q6 (b)

c. What are the initial conditions and their use in network analysis? **(04 Marks)**

Module-4

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

b. Find the Laplace transform of the, (i) $f(t) = 5 + 4e^{-2t}$ (ii) $e^{-at}\sin\omega t$ **(04 Marks)**

c. Obtain the Laplace transform of the function shown in Fig.Q 7(c). **(08 Marks)**

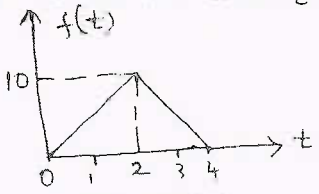

Fig. Q7 (c)

OR

8 a. Find the inverse Laplace transform,

(i) $\frac{s^2+5}{s(s^2+4s+4)}$ (ii) $\frac{2s+6}{s^2+6s+25}$ **(06 Marks)**

b. Obtain Laplace transform of,

(i) $f(t) = 5(t-2)u(t-1)$

(ii) $f(t) = 4e^{-3t}[u(t+2) - u(t-2)]$

(iii) $\delta(t)$

(iv) $u(t)$ **(08 Marks)**

c. Sketch the waveforms,

(i) $tu(t-T)$ (ii) $(t-T)u(t-T)$ (iii) $u(-t)$ (iv) $tu(t+T)$ **(06 Marks)**

Module-5

9 a. Determine the line currents and total power supplied to a delta connected load of $Z_{ab} = 10\angle 60^\circ\,\Omega$, $Z_{bc} = 20\angle 90^\circ\,\Omega$ and $Z_{ca} = 25\angle 30^\circ\,\Omega$. Assume a 3 phase, 400 V, ABC system. **(08 Marks)**

b. Define Z and Y parameters. **(04 Marks)**

c. Find the Z parameters of the network shown in Fig. Q9 (c). **(08 Marks)**

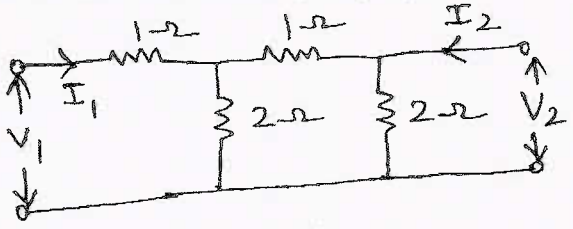

Fig. Q9 (c)

OR

10 a. Determine the line currents in an unbalanced star connected load supplied from a symmetrical 3 phase, 440 V system. The branch impedances are $Z_R = 4\angle 30^0\,\Omega$, $Z_Y = 10\angle 45^0\,\Omega$ and $Z_B = 10\angle 60^0\,\Omega$. The phase sequence is RYB. **(08 Marks)**

b. Find Y-parameters for the network shown in Fig. Q10 (b) **(08 Marks)**

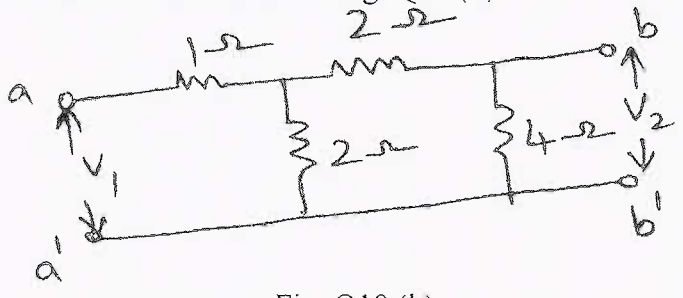

Fig. Q10 (b)

c. Write the conditions for symmetry and reciprocity of Z and Y parameters of a two port network. **(04 Marks)**

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17EE34

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Draw a double ended clipper circuit and explain its working principle with transfer characteristics. **(07 Marks)**

b. Draw and explain the working of clamper circuit which clamps the positive peak of a signal to zero. **(07 Marks)**

c. With suitable graph, explain the significance of operating point. **(06 Marks)**

OR

2 a. Derive the expression for stability factor for fixed bias circuit, with respect to I_{co}, V_{BE} and β. **(07 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. **(08 Marks)**

c. Calculate the Q point values (I_c and V_{CE}) for the circuit given in Fig Q2(c). **(05 Marks)**

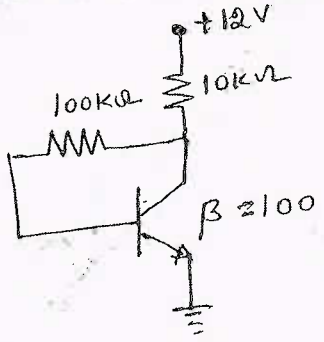

Fig Q2(c)

Module-2

3 a. State and prove Millers theorem. **(08 Marks)**

b. Starting from fundamentals define h-parameters and obtain an h-parameter equivalent circuit of common emitter configuration. **(08 Marks)**

c. Compare the characteristics of CB, CE and CC configurations. **(04 Marks)**

OR

4 a. Derive an expression for input impedance volt gain, current gain and output impedance for an emitter follower circuit using h-parametesr model for the transistor. **(08 Marks)**

b. For the transistor connected in CE configuration, determine A_v, A_i, R_i and R_o using complete hybrid equivalent model.
Given $R_L = R_s = 1k\Omega$, $h_{ie} = 1k\Omega$, $h_{re} = 2\times10^{-4}$, $h_{fe} = 100$ and $h_{oe} = 20\mu A/V$ **(08 Marks)**

c. A transistor in CE mode has h-parameters
$h_{ie} = 1.1k\Omega$, $h_{re} = 2\times10^{-4}$, $h_{fe} = 100$ and $h_{oe} = 25\mu A/V$. Determine the equivalent CB parameters. **(04 Marks)**

Module-3

5 a. Draw the circuit of Darlington emitter follower. Derive the expression for current gain using its ac equivalent circuit. **(08 Marks)**

b. What are the advantages of negative feedback in amplifiers? Explain briefly. **(06 Marks)**

c. For the voltage series feedback amplifier, derive an expression for output impedance. **(06 Marks)**

OR

6 a. Explain the need of cascading amplifier. Draw and explain the block diagram of two stage cascade amplifier. **(08 Marks)**

b. A given amplifier arrangement has the following voltage gains $A_{V_1} = 10$ $A_{V_2} = 20$ and $A_{V_3} = 40$. Calculate the overall voltage gain and determine the total voltage gain in dBs. **(06 Marks)**

c. An amplifier with negative feedback has a voltage gain of 120. It is found that without feedback an input signal of 60mV is required to produce a particular output, whereas with feedback the input signal must be 0.5V to get the same output. Find voltage gain (A_V) and β of the amplifier. **(06 Marks)**

Module-4

7 a. Derive an expression for frequency of oscillations in Wien bridge' oscillator. **(08 Marks)**

b. Explain the operation of class B push pull amplifier. Prove that the maximum efficiency of class B configuration is 78.5%. **(08 Marks)**

c. A crystal has following parameters. L = 0.3344H, C = 0.065pF, C_m = 1pF and R = 5.5kΩ. Calculate: i) Series resonance frequency ii) Parallel resonance frequency. **(04 Marks)**

OR

8 a. Explain the operation of class A transformer coupled power amplifier and prove that the maximum efficiency is 50%. **(08 Marks)**

b. A class B push pull amplifier operating with V_{CC} = 25V provides a 22V peak signal to 8Ω load. Calculate circuit efficiency and power dissipated per transistor. **(06 Marks)**

c. Explain the principle of operation of oscillator and the effect of loop gain (Aβ) on the output of oscillator. **(06 Marks)**

Module-5

9 a. With the help of neat diagram, explain the working and characteristics of N-channel JFET. **(08 Marks)**

b. Determine Z_i, Zo and A_v for JFET common source amplifier with fixed bais configuration using AC equivalent small signal model. **(08 Marks)**

c. Write down the differences between BJT and JFET. **(04 Marks)**

OR

10 a. With the help of neat diagrams, explain the construction, working and characteristics of N-channel depletion type MOSFET. **(10 Marks)**

b. Write down the differences between MOSFET and JFET. **(04 Marks)**

c. For the circuit given in the Fig Q10(c), determine: i) Input impedance ii) Output impedance and iii) voltage gain. **(06 Marks)**

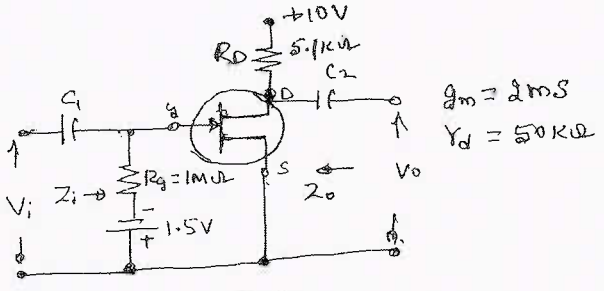

Fig Q10(c)

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17EE35

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Define canonical minterm form and canonical maxterm form. **(05 Marks)**

b. Compare between prime implicant and essential prime implecant. Indentify all the prime implecants and essential prime implecants of the following functions using k-map :
$f(a, b, c, d) = \pi_M (0, 2, 3, 8, 9, 10, 12, 14)$. **(07 Marks)**

c. Simplify the following boolean function using k-map, and implement by logic gates.
$f(A, B, C, D, E) = \sum_m (3, 7, 10, 11, 12, 13, 14, 15, 17, 19, 21, 23, 25, 27, 28, 29, 31) + \sum_d (2, 6, 26, 30)$ **(08 Marks)**

OR

2 a. Convert the given boolean function into minterm canonical form.
$f(a, b, c) = (\bar{a} + b)(b + \bar{c})$. **(05 Marks)**

b. Simplify the following boolean fucntion using k-map
$f(P, Q, R, S) = \sum_m (0, 2, 4, 5, 6, 8, 10, 15) + \sum_d (7, 13, 14)$. **(07 Marks)**

c. Using Quine – McCluskey method, obtain a minimal SOP expression for
$f(a, b, c, d) = \sum_m (2, 3, 4, 5, 13, 15) + \sum_d (8, 9, 10, 11)$. **(08 Marks)**

Module-2

3 a. Design two bit magnitude comparator and draw the logic diagram. **(10 Marks)**

b. Write a short note on encoders. **(05 Marks)**

c. Design full adder using two numbers of 4:1 MUX. **(05 Marks)**

OR

4 a. Explain look ahead carry adder. **(10 Marks)**

b. Implement following multiple output function using IC74138 and external gates. **(05 Marks)**
$F_1 (A, B, C) = \sum_m (1, 4, 5, 7)$ and $F_2 (A, B, C) = \pi_m (2, 3, 6, 7)$.

c. Design 16:1 multiplexer using 8:1 MUX. **(05 Marks)**

Module-3

5 a. Explain the working of master slave JK flip-flops with functional table and timing diagram. Show how race around condition is overcome. **(08 Marks)**

b. Obtain characteristic equation of SR flip-flop. **(05 Marks)**

c. Explain working of 3-bit binary ripple counter with the suitable logic and timing diagram. **(07 Marks)**

OR

6 a. Convert JK flip-flop to D flip flop. **(05 Marks)**

b. Explain the 4 modes of operation of shift register with suitable logic diagram and truth table. **(08 Marks)**

c. Design MOD – 6 synchronous counter using D flip-flop. **(07 Marks)**

Module-4

7 a. Analyze the following sequential circuit given in Fig Q7(a) and obtain excitation, transition and state table. Also write the state diagram.

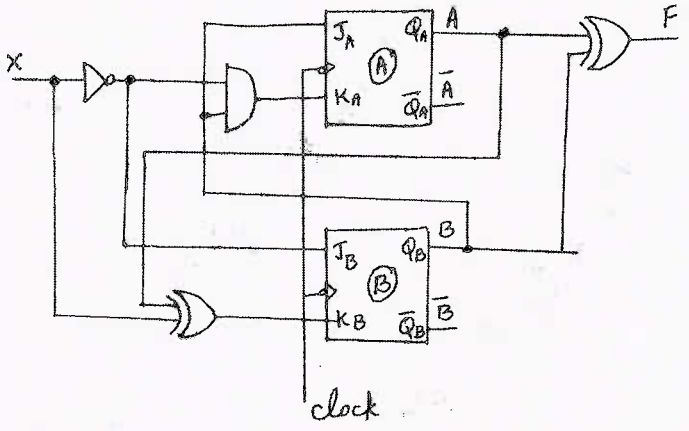

Fig Q7(a) **(12 Marks)**

b. Design a synchronous counter with the sequence 0, 1, 3, 7, 6, 4, 0 . . . . . using JK flip-flop. **(08 Marks)**

OR

8 a. Design a clocked sequential circuit that operates according to the state diagram shown in Fig Q8 (a) implement the circuit using D flip flop.

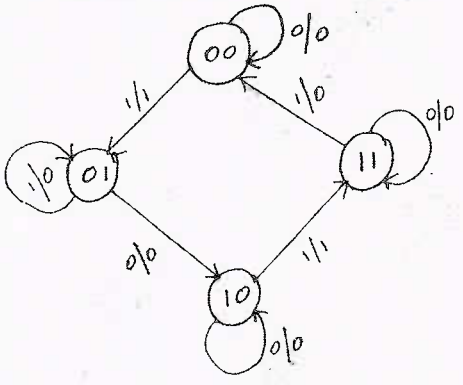

Fig Q8(a) **(12 Marks)**

b. With the help of block diagram explain Mealy and Moore model in a sequential circuit analysis. Give the example circuits. **(08 Marks)**

Module-5

9 a. Write the comparison between VHDL and verilog. **(08 Marks)**

b. Explain the various data types available in VHDL. **(06 Marks)**

c. Write HDL code of a 2 × 1 multiplexer – VHDL. **(06 Marks)**

OR

10 a. Write a data flow description for a full adder with active high enable in both VHDL and verilog. **(08 Marks)**

b. Explain shift and rotate operators in HDL with an example. **(08 Marks)**

c. Explain the structure of verilog module. **(04 Marks)**

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17EE36

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. List the limitations of wheatstone Bridge and explain how low resistance is measured by KDB. **(08 Marks)**

b. With a neat circuit diagram derive the balancing equiaton for Maxwell Inductance – Capacitance Bridge. **(06 Marks)**

c. A Maxwell's capacitance bridge shown in Fig Q1(c) is used to measured an unknown inductance in comparison with capacitance. The various values at balance. $R_2 = 400\Omega$; $R_3 = 600\Omega$, $R_4 = 1000\Omega$; $C_4 = 0.5\mu F$. Calculate the values of R_1 and L_1 calculate also the value of storage (Q) factor of coil if frequency is 1000 Hz. **(06 Marks)**

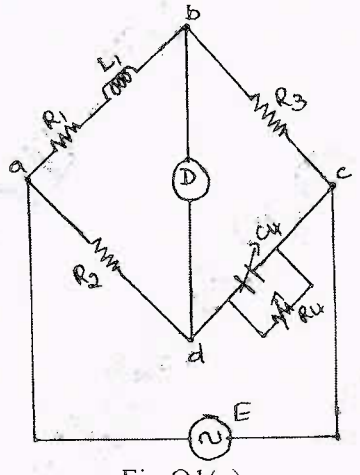

Fig Q1(c)

OR

2 a. Explain in brief fall of potential method for earth resistance measurement. **(08 Marks)**

b. Describe the working of Schering bridge. Derive the equation for capacitance and dissipation factor. Draw the phasor diagram of the bridge under balance conditions. **(12 Marks)**

Module-2

3 a. Explain the construction and working principle of electrodynamometer Wattmeter for the measurement of power in the circuit. **(08 Marks)**

b. Discuss the constructional features and working principle of rotating type phase sequence indicator. **(06 Marks)**

c. A three phase induction motor draws a power input at a voltage of 250V. 20A. and 0.8 power factor lag: Find percentage error in wattmeter reading if ,
i) Pressure coil is on supply side ii) Current coil is on supply side. Assume current coil resistance and pressure coil resistance = 0.2Ω and 5000Ω. **(06 Marks)**

OR

4 a. Explain the error in a LPF Wattmeter and give the adjustments done to compensate for the error. **(08 Marks)**

b. Explain the working principle of Weston frequency meter. **(06 Marks)**

c. A 250V, single phase energy meter has a constant load of 5A passing through it for 8 hours at 0.8pf. If the disc makes 3200 revolutions during this period, what is Energy meter constant in revolutions per kilo-watt-hour? Calculate the pf of the load, if the number of revolutions made by the energy meter is 600, when operating at 250V, 6A for 2 hrs. **(06 Marks)**

Module-3

5 a. Explain the construction and theory of instrument transformer. **(06 Marks)**

b. Explain the characteristics of current transformer. **(08 Marks)**

c. Explain the measurement of magnetizing force (H). **(06 Marks)**

OR

6 a. What is shunt? How it is used to extend the range of an ammeter. **(06 Marks)**

b. With neat circuit diagram, explain Silsbee's method of testing C.T. **(08 Marks)**

c. Explain the measurement of leakage factor using search coil. **(06 Marks)**

Module-4

7 a. With a block diagram, explain the working of a true R.M.S responding voltmeter. **(08 Marks)**

b. With a block diagram, explain the working of a Ramp type DVM. **(08 Marks)**

c. List the advantages of electronic energy meter over the conventional energy meter. **(04 Marks)**

OR

8 a. List the performance characteristics of a Digital voltmeter. **(07 Marks)**

b. With a neat sketch, explain the working of the Q-meter. **(07 Marks)**

c. With a neat block diagram, explain the principle of working of electronic energy meter. **(06 Marks)**

Module-5

9 a. Explain LED and LCD displays. **(10 Marks)**

b. Write short note on nixie tube. **(05 Marks)**

c. Write a short note on strip-chart recorder. **(05 Marks)**

OR

10 a. Write a short note on types of segment displays. **(06 Marks)**

b. With a neat sketch, explain the working of a X-Y recorder. **(08 Marks)**

c. Write a short note on Null balance recorders. **(06 Marks)**

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15EE32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Find 'I_a' shown in the circuit in Fig Q1(a) using mesh analysis. **(08 Marks)**

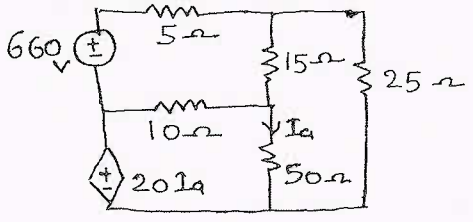

Fig Q1(a)

b. Find the I_x in the circuit show in Fig Q1(b) using source transformation.

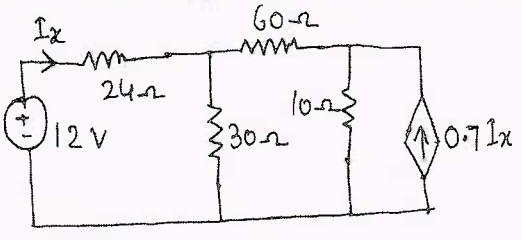

Fig Q1(b) **(08 Marks)**

OR

2 a. Find V_1 in the circuit shown in Fig Q2(a) using node analysis,. When V_2 = 20 volts.

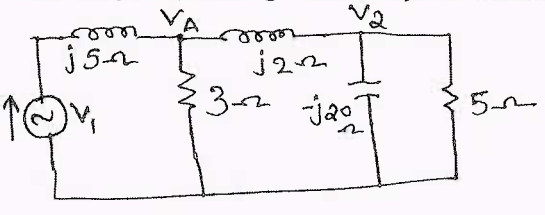

Fig Q2(a) **(06 Marks)**

b. A series RLC circuit consist of R = 50Ω, L = 0.2H, C = 10μF, with an applied voltage of 20V. Determine resonant frequency half power frequencies, Q – factor and B.W of the circuit. **(05 Marks)**

c. Find the current I in the circuit show in Fig Q2(c). Using star delta transformation. **(05 Marks)**

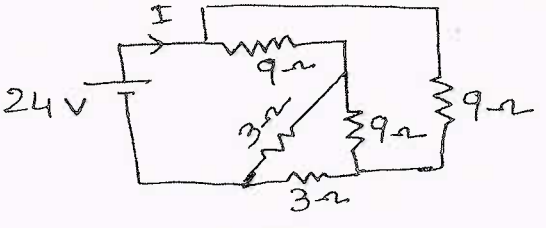

Fig Q2(c)

Module-2

3 a. State maximum power transfer theorem. **(03 Marks)**

b. For the circuit shown in Fig Q3(b). Find current 'I' using super position theorem. **(05 Marks)**

c. Find V_x in the circuit shown in Fig Q3(c) and hence verify reciprocity theorem.

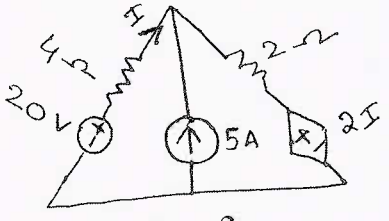

Fig Q3(b)

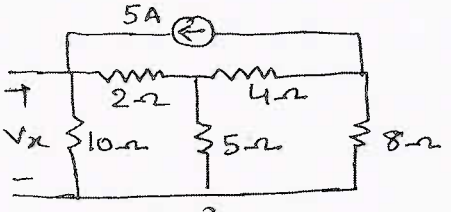

Fig Q3(c) **(08 Marks)**

OR

4 a. For the circuit shown in Fig Q4(a) obtain the Thevnin's equivalent across A – B.

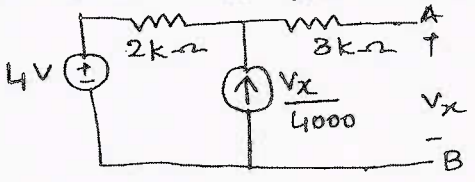

Fig Q4(a) **(06 Marks)**

b. Find I using Millman's theorem for the network shown in Fig Q4(b).

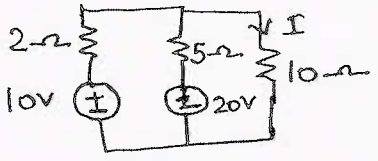

Fig Q4(b) **(04 Marks)**

c. Find the value of i_b in the Fig Q4(c) using Norton's theorem.

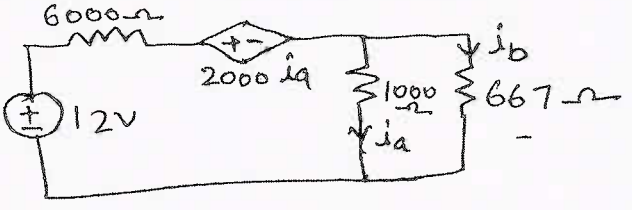

Fig Q4(c) **(06 Marks)**

Module-3

5 a. On the circuit shown in Fig Q5(a). the switch 'S' removed from a to b at t = 0. Find i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$ steady state is achieved when switch is at a. **(08 Marks)**

b. In the circuit shown in Fig Q 5(b) switch K is opened at t = 0. Find the value of V_1 $\frac{dv}{dt}$, $\frac{d^2v}{dt^2}$ at $t = 0^+$. **(08 Marks)**

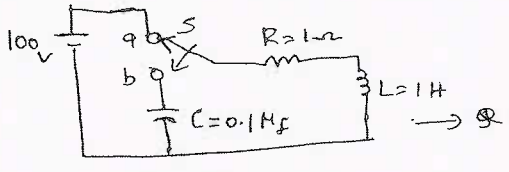

Fig Q5(a)

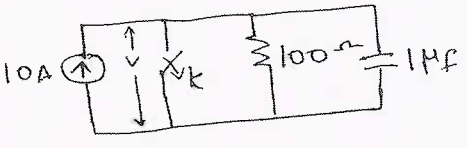

Fig Q5(b)

OR

6 a. In the circuit shown Fig Q6(a) determine the complete solution of current when switch is closed at t = 0. **(08 Marks)**

b. In the circuit sown in Fig Q6(b). Determine $V_a(0^-)$, $V_a(0^+)$ at t = 0. Steady state is reached with switch open. **(08 Marks)**

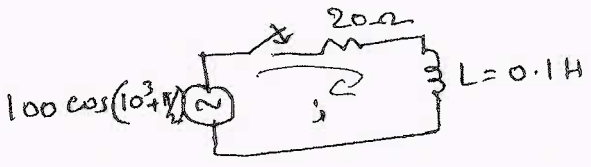

Fig Q6(a)

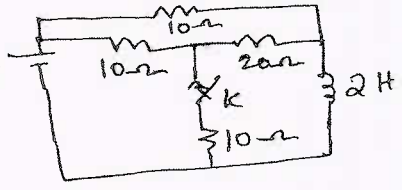

Fig Q6(b)

Module-4

7 a. Use initial and final value theorem to find F(0) and F(α)

$$F(s) = \frac{s^3 + 7s^2 + 5}{s(s^3 + 3s^2 + 4s + 2)}.$$ **(04 Marks)**

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

c. Obtain the Laplace transform of the function shown in Fig Q7(c) **(06 Marks)**

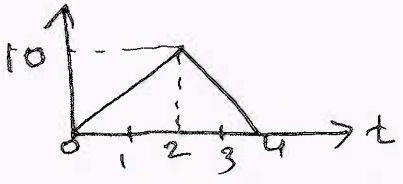

Fig Q7(c)

OR

8 a. Derive the Laplace transform of a periodic signal. **(08 Marks)**

b. Obtain the Laplace transform of the given wave form in Fig Q8(b). **(08 Marks)**

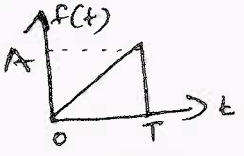

Fig Q8(b)

Module-5

9 a. A three phase, 400V, 4 wire system has a star connected load with $Z_A = (10 + j0)\Omega$, $Z_B = (15 + j10)\Omega$, $Z_c = (0 + j5)\Omega$. Find the line currents and current through neutral wire. **(06 Marks)**

b. Define Z and Y parameters. **(04 Marks)**

c. Find z parameters for the circuit in Fig Q9(c).

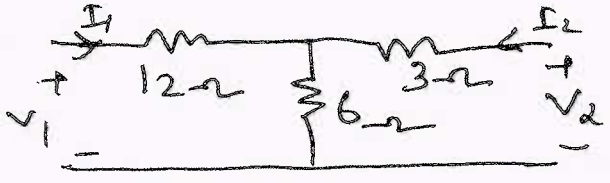

Fig Q9(c) **(06 Marks)**

OR

10 a. Find $V_c(t)$ in the circuit shown in Fig Q10(a) assuming zero initial condition. **(08 Marks)**

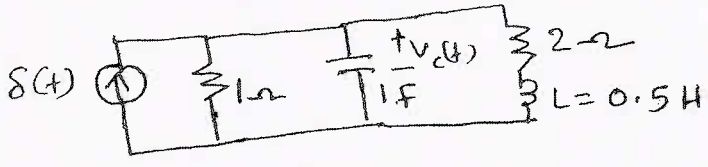

Fig Q10(a)

b. The pole – zero plot for an R-L-C circuit, driving point admittance, is as shown in Fig Q10(b). Find the values of R, L ,C. **(08 Marks)**

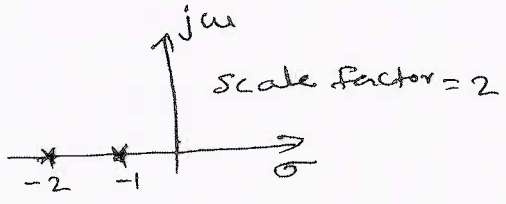

Fig Q10(b)

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15EE33

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 any

Module-1

1 a. With the help of phasor diagram, explain the operation of practical transformer on load. **(08 Marks)**

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

OR

2 a. Explain star zig – zag – star and open delta connection with the help of connection diagram and phasor diagram. Mention its advantages applications. **(10 Marks)**

b. The parameters of 10KVA, 500/250V, 50Hz , single – phase transformer are as follows :

Primary resistance = 0.2Ω Primary reactance = 0.4Ω
Secondary resistance = 0.5Ω Secondary reactance = 0.1Ω

Exciting circuit resistance and reactance are 1500Ω and 750Ω respectively. Find out results of O.C and S.C test. **(06 Marks)**

Module-2

3 a. What is the need for parallel operation of transformer? Mention the conditions to be satisfied for parallel operation and explain. **(08 Marks)**

b. An autotransformer is used to supply a resistive load of 5kW at 400V. Supply voltage is 440V. Neglecting the losses calculate the currents in various parts of the winding. Find the percentage of copper saving effected due to use of the autotransformer instead of equivalent two winding transformer. **(08 Marks)**

OR

4 a. With a neat diagram, explain the construction and operation of on load tap changer for transformer. **(08 Marks)**

b. Two transformers gave the followings test results: with the LV side shorted, transformer A takes current of 10A at 200V, power input is 1000W. Similarly transformer B takes 30A at 200V; the power input is 1500W. On open circuit both transformers gave a secondary voltage of 2200V when 11KV is applied to the primary terminals. These terminals of the two transformers are connected in parallel. Calculate the load shared by each transformer. **(08 Marks)**

Module-3

5 a. Explain the current in rush phenomenon in transformer. **(04 Marks)**

b. With neat diagram, explain the commutation process in DC machines. **(06 Marks)**

c. A 4- pole, 3 – phase, 50Hz star connected alternator has 60 slots, with 4 conductors per slot. The coils are short pitched by 3 slots. If the phase spread is 60°, find the line voltage induced for a flux per pole of 0.943 wb, sinusoidally distributed in space. All the turns per phase are in series. **(06 Marks)**

OR

6 a. With a neat diagram, explain how sumpnesis test is used to find efficiency and voltage regulation of a transformer? **(06 Marks)**

b. A 4 – pole, lap wound armature running at 1400rpm delivers a current of 100A and has 64 conductor segments. The brush width is equal to 1.4 commutator segments and inductance of each armature coil is 0.05mH. Calculate the value of the reactance voltage assuming linear commutation. **(06 Marks)**

c. What are the methods used to reduce the harmonics in alternator? **(04 Marks)**

Module-4

7 a. Explain the effect of variation of excitation of an alternator supplying constant load. **(08 Marks)**

b. A synchronous generator has a direct axis synchronous reactance of 0.8pu and a quadrature axis synchronous reactance of 05pu. It is supplying full load at rated voltage at 0.8 p.g lag. Find the open circuit voltage. **(08 Marks)**

OR

8 a. Explain two reaction theory as applied to synchronous machines. **(08 Marks)**

b. Two identical, three phase star connected alternators, operating in parallel share equally a total load of 1000kW at 6600V and 0.8 power factor lagging. The field of the first generator is excited so that the armature current is 50A lagging. Find

i) Armature current of second machine

ii) The power factor of each machine. **(08 Marks)**

Module-5

9 a. Explain MMF method of determining voltage regulation of an alternator. **(08 Marks)**

b. A 3 – phase, 10KVA, 400V, 50Hz star connected alternator supplies the rated load at 0.8 power factor lagging. If the armature resistance is 0.5Ω, and synchronous reactance is 10Ω, find the voltage regulation. **(08 Marks)**

OR

10 a. With suitable graphs, explain the capacity curves for an alternator. **(08 Marks)**

b. A 2300V, 50Hz, 3 – phase 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 0.8 p.g, lagging and 0.8 leading for the full load current of 25A. **(08 Marks)**

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15EE34

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Explain diode positive shunt clipper circuit with waveforms and transfer characteristics. **(05 Marks)**

b. What is transistor biasing? Explain emitter bias circuit with relevant circuit and equations. **(06 Marks)**

c. Design a suitable circuit represented by the box shown below, which has input and output waveforms as indicated. **(05 Marks)**

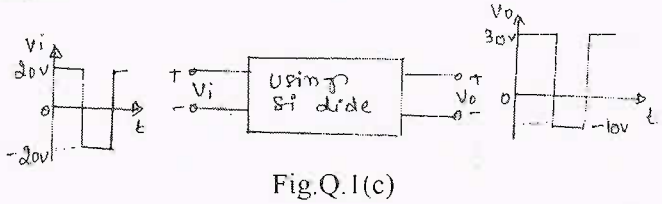

Fig.Q.1(c)

OR

2 a. What is Clamping circuit? Explain the negative Clamping circuit with necessary waveforms. **(05 Marks)**

b. Obtain the expression for stability factors $S(I_{CO})$ and $S(V_{BE})$ for fixed bias circuit. **(06 Marks)**

c. For the fixed bias circuit as shown in below Fig.Q.2(c). Assuming $V_{BE} = 0.7V$ and $\beta = 60$. Find: i) I_{BQ}, I_{CQ} and V_{CEQ} ii) V_B and V_C. **(05 Marks)**

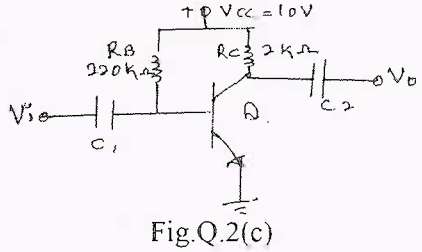

Fig.Q.2(c)

Module-2

3 a. What are the advantages of h-parameters? **(04 Marks)**

b. Obtain an h-parameter equivalent circuit of CB and CE configuration. **(06 Marks)**

c. For the circuit shown below. Determine: i) re ii) Z_i, Z_o, A_v and AI taking $r_o = \infty\Omega$. **(06 Marks)**

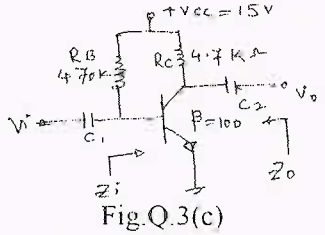

Fig.Q.3(c)

OR

4 a. Explain the law frequency response of single stage RC coupled amplifier. **(08 Marks)**

b. What is Miller effect? Derive the equations for miller input and output capacitance. **(08 Marks)**

Module-3

5 a. What is a cascading amplifier? Obtain the expression for over all voltage gain for 3 stage amplifier. **(06 Marks)**

b. With the help of block diagram, explain the concept of feed back. **(07 Marks)**

c. Write the important characteristics and application of Darlington emitter follower. **(03 Marks)**

OR

6 a. Obtain expression for voltage gain, input impedance and output impedance of a Darlington emitter follower. Draw the necessary equivalent circuit. **(08 Marks)**

b. Write the important advantages of a negative feed back amplifier and show that how band width of an amplifier increases with negative feed back. **(08 Marks)**

Module-4

7 a. Explain the operation of a class B push-pull amplifier and derive its conversion efficiency. **(06 Marks)**

b. With a neat circuit diagram, explain the operation of BJT Colpitt's oscillator. **(05 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 $I_1 = 3.3A$ and $R_C = 4\Omega$. Calculate: i) THD ii) Fundamental power component (P_1) iii) Total power (P_T). **(05 Marks)**

OR

8 a. Mention the classification of power amplifier and explain series fed class A power amplifier with conversion efficiency. Write its merits and demerits. **(08 Marks)**

b. With a neat circuit diagram, explain the working of series resonant crystal oscillator. A crystal has L = 0.334H, C = 0.065 PF, C_M = 1PF and R = 5.5KΩ. Calculate its series and parallel resonant frequency. **(08 Marks)**

Module-5

9 a. Explain the construction, working and characteristics of n-channel JFET. **(08 Marks)**

b. For the FET amplifier shown below: i) Calculate Z_i and Z_o ii) Calculate A_v. I_{DSS} = 15mA, V_p = -6v, Y_{os} = 25μs. **(05 Marks)**

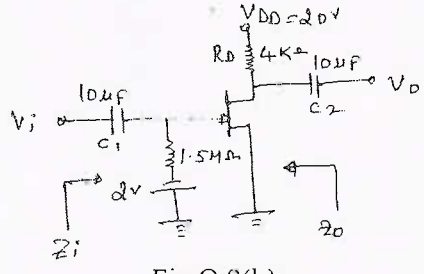

Fig.Q.9(b)

c. Write important characteristics of common-source configuration of JFET. **(03 Marks)**

OR

10 a. Define trans conductance gm and derive an expression for gm. **(06 Marks)**

b. Compare JFET and MOSFET. **(04 Marks)**

c. Explain the operation and characteristic of n-channel MOSFET. **(06 Marks)**

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15EE36

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Electrical and Electronics Measurements

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. The expression for the mean torque of an electrodynamometer type of wattmeter is given by $T_d \alpha M^a E^b Z^c$ where M = mutual inductance between fixed and moving coils, E = applied voltage and Z = Impedance of load circuit. Determine the values of a, b, and c using dimensional analysis and write the equation for T_d. **(08 Marks)**

b. Explain the fall of potential method used for the measurement of earth resistance. **(08 Marks)**

OR

2 a. Derive the equations for balance in case of Maxwell's inductance capacitance bridge. Draw the phosor diagram for balance condition. **(08 Marks)**

b. An DC bridge has the following braches :
Arm ab : an unknown impedance (R_1, L_1) in series with a non inductive variable resistor r_1.
Arm bc : a non inductive resistor $R_3 = 100\Omega$
Arm cd : a non inductive resistor $R_4 = 200\Omega$
Arm da : a non inductive resistor $R_2 = 250\Omega$
Arm dc : a non inductive variable resistor r,
Arm ec : lossless capacitor c = 1μF and
Arm be : a detector
An AC supply is connected between a and C. Calculate resistance R_1 and inductance L_1 under balance condition. $r_1 = 43.1\Omega$ and $r = 229.7\Omega$. **(08 Marks)**

Module-2

3 a. Explain the special features incorporated in an electrodynamometer type of wattmeter so that it can be used for low power factor application. **(08 Marks)**

b. Explain how the following adjustments are made in single phase induction type energy meter i) lag adjustment ii) adjustment for friction compensation iii) over load compensation iv) creeping. **(08 Marks)**

OR

4 a. Describe the constructional details and working of a single phase electrodynamometer type of p.f meter. Prove that the special displacement of moving system is equal to the phase angle of the system. **(08 Marks)**

b. Explain the construction and working of Weston type frequency meter. **(08 Marks)**

Module-3

5 a. How is the current range of a PMMC instrument extended with the help of shunts? Describe the method of reducing the errors due to temp charges in the shunt connected equipment. **(08 Marks)**

b. The exciting current of a current transformer is 2A logging 40° to the secondary voltage reversed. The C.T has a bar primary and a nominal ratio of 100/1A. The external burden is 1.5Ω and the resistance of the secondary winding is 0.25Ω. When 1A of current is flowing through the secondary winding, calculate the actual ratio of C.T and its phase angle. **(08 Marks)**

OR

6 a. Describe a method of experimental determination of flues density in a specimen of magnetic material using a ballistae galvanometer. **(08 Marks)**

b. Explain the construction and working of Hopkinson permeametor. **(08 Marks)**

Module-4

7 a. With block diagram, explain the working of true RMS reading voltmeter. **(08 Marks)**

b. With block diagram explain the working of Ramp type DVM. **(08 Marks)**

OR

8 a. Describe the working principle of Q-meter with circuit diagram. **(08 Marks)**

b. With block diagram, explain the working of electronic energy meter. **(08 Marks)**

Module-5

9 With a neat sketches explain the function the following instruments used in electronic devices : i) LED ii) LCD iii) Nixe tubes. **(16 Marks)**

OR

10 a. Explain with a suitable circuit diagram of an x-y recorder mention its advantages and disadvantages. **(08 Marks)**

b. With a neat diagram, explain the construction and working principle of strip chart recorder. **(08 Marks)**

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15EE42

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Power Generation and Economics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define the terms with graph : i) Hydrograph ii) Flow duration curve iii) Mass curve. **(06 Marks)**

b. What are the points to be considered for the selection of site in hydro power plant? **(06 Marks)**

c. List out the merits and demerits of Hydro Power Plant. **(04 Marks)**

OR

2 a. Explain the components of high head hydroelectric power plant with its schematic arrangement. **(10 Marks)**

b. Explain the classification of hydro electric power plant based on water head. **(06 Marks)**

Module-2

3 a. Mention the classification of stokers. Explain overfeed and underfeed stoker with diagram. **(08 Marks)**

b. What is Steam prime movers? Explain Impulse and Reaction turbine. **(08 Marks)**

OR

4 a. Explain how the use of Regenerator, Intercooler and Reheater in gas – turbine power plant help in improvement of thermal efficiency. **(08 Marks)**

b. With a flow diagram, explain the Fuel handling system. **(04 Marks)**

c. Give the application of Diesel Power Plant. **(04 Marks)**

Module-3

5 a. Mention the factors which go in favour of Nuclear Power station. **(06 Marks)**

b. What are the classification of Nuclear Reactor? Explain BWR with diagram. **(10 Marks)**

OR

6 a. With a neat sketch, explain the main parts of Nuclear Reactor. **(10 Marks)**

b. Write briefly about Nuclear Waste Disposal. **(06 Marks)**

Module-4

7 a. Define the terms :
i) Circuit breakers ii) Lighting arresters iii) Reactors and capacitors. **(04 Marks)**

b. Explain the Interconnection of power station with its advantages and disadvantages. **(04 Marks)**

c. Write short notes on : i) Resistance Grounding ii) Reactance Grounding. **(08 Marks)**

OR

8 a. Give short notes on : i) Resonant Grounding ii) Solid Grounding. **(08 Marks)**

b. With neat sketch, explain single bus bar system. **(08 Marks)**

Module-5

9	a.	What are the main disadvantages and causes of poor power factor?	(07 Marks)
	b.	Mention the measures by which low power factor can be avoided.	(05 Marks)
	c.	Discuss the Economics of Power factor correction.	(04 Marks)

OR

10	a.	Define Tariff. Explain different types of Tariffs.	(06 Marks)
	b.	What are the main objectives in framing a Tariff?	(06 Marks)
	c.	Explain the types of consumers and write the general form of Tariff.	(04 Marks)

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15EE43

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Explain with the help of a neat diagram and typical transmission and distribution system scheme indicating the standard voltages. **(05 Marks)**

b. With neat diagram, explain Feeders, Distributors and service Mains. **(03 Marks)**

c. The towers of height 30m and 90m respectively support transmission line conductor's at water crossing. The horizontal distance between the tower is 500m. If the tension in the conductor is 1600kg, find the minimum clearance of the conductor and water and clearance midway between the support weight of conductor is 1.5kg/m, Bases of the towers can be considered to be at water level. **(08 Marks)**

OR

2 a. Explain the advantages of (i) ACSR (ii) AAAC iii) ZTAI iv) GTACSR (v) GZTACSR **(05 Marks)**

b. With neat diagram derive a expression for the sag when the supports are at equal heights. **(05 Marks)**

c. Explain the classification of Insulators? Define string efficiency? Methods of improving string efficiency. **(06 Marks)**

Module-2

3 a. With neat diagram. Develop an expression for Inductance of a 3 phase over head line with unsymmetrical spacing. **(06 Marks)**

b. Explain the concept of (i) Self GMD (ii) Mutual GMD. **(04 Marks)**

c. Calculate the Inductance of each conductor in a 3 phase 3 wire system when the conductors are arranged in a horizontal plane with spacing such that D_{31} = 4m, D_{12} = D_{23} = 2m, the conductors are transposed and have a diameter of 2.5cm. **(06 Marks)**

OR

4 a. With neat diagram Develop an expression for capacitance of a 3 phase over head line with symmetrical and unsymmetrical spacing. **(10Marks)**

b. A 3phase, 50Hz, 66kV overhead line conductors are placed in horizontal plane as shown in Fig Q4(b)

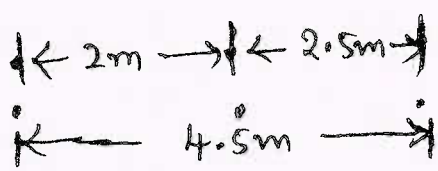

Fig Q4(b)

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. **(06 Marks)**

Module-3

5 a. Show how regulation and transmission efficiency are determined for medium transmission line using nominal T method. Illustrate your answer with suitable vector diagram. **(05 Marks)**

b. A 3 phase, 50Hz, 150km line has a resistance inductive reactance and capacitive shunt admittance of 0.1Ω, 0.5Ω and 3×10^{-6} S per km per phase. If the line delivers 50mW at 110kV and 0.8pf lagging. Determine the sending end voltage and current. Assume a nominal π circuit of the line. **(08 Marks)**

c. Differentiate the types of over head transmission lines. **(03 Marks)**

OR

6 a. Develop the Generalized circuit constants for (i) short transmission line (ii) Medium line – nominal T method. **(08 Marks)**

b. Find the following for a single circuit transmission line delivering a load of 50MVA at 110kV and p.f 0.8 lagging:
(i) Sending end voltage (ii) Sending end current (iii) Sending end power
(iv) Efficiency of transmission.
Given A = D = $0.98\angle 3^\circ$ B = $110\angle 75^\circ$ Ω, C = $0.0005\ \angle 80^\circ$ Siemen. **(08 Marks)**

Module-4

7 a. What is Corona? What are the factors which affect Corona? **(04 Marks)**

b. Explain the following terms with reference to corona
(i) Critical disruptive voltage
(ii) Visual critical voltage **(06 Marks)**

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

OR

8 a. With neat diagram. show the various parts of high voltage single core cable. **(04 Marks)**

b. Define Grading of cables, Analyze capacitance Grading. **(08 Marks)**

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

Module-5

9 a. With neat diagram, explain the concept of AC distributor. With concentrated loads. **(08 Marks)**

b. A single phase ac distributor AB 300 meters long is fed from End A and is loaded as under
i) 100A at 0.707 pf lagging 200m from point A
ii) 200A at 0.8pf lagging 300m from point A
The load resistance and reactance of the distributor is 0.2Ω and 0.1Ω per kilometer. Calculate the total voltage drop in the distributor. The load power factor refer to the voltage at the far end. **(08 Marks)**

OR

10 a. Define reliability, power Quality. **(06 Marks)**

b. Limitations of Distribution systems. **(07 Marks)**

c. Explain the effect of disconnection of natural in a 3 phase four wire system. **(03 Marks)**

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CBCS SCHEME

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15EE44

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 significance of back emf in DC motors. **(04 Marks)**

b. Describe with a neat sketch the working of 3-point starter. **(06 Marks)**

c. A 250 V DC shunt motor on no load runs at 1000 rpm and takes 5A. The total armature circuit and shunt field resistance are 0.2Ω and 250Ω respectively. Calculate the speed when loaded and taking a current of 50A, if armature reaction weakens the field by 3%. Assume a brush contact drop of 1V at each brush. **(06 Marks)**

OR

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

b. Explain briefly the losses in DC motor. **(05 Marks)**

c. A 60 KW, 500 V DC shunt motor has a lap connected armature with 492 conductors. Flux/pole is 0.05 wb and full load efficiency is 90%. Its armature resistance is 0.1Ω and shunt field resistance is 250Ω. Find for full load (i) speed (ii) useful torque, if 6% of the torque is lost in friction. **(06 Marks)**

Module-2

3 a. Discuss in detail the Swinburn's test conducted on DC machine for predetermination of efficiency. **(05 Marks)**

b. Derive an expression for the torque of an induction motor and obtain the condition for maximum torque. **(05 Marks)**

c. A Retardation test is carried out on a 1000 rpm DC machine. The time taken for the speed to fall from 1030 rpm to 970 rpm is,

1) 40 seconds with no excitation
2) 20 seconds with full excitation
3) 9 seconds with full excitation and the armature supplying an extra load of 10 A at 225 V. Calculate:

i) The moment of inertia of the armature in kg-m^2.
ii) Iron losses
iii) The mechanical losses at the mean speed of 1000 rpm. **(06 Marks)**

OR

4 a. Describe the field test applied to two similar DC series motors. **(05 Marks)**

b. The following results were obtained during Hopkinson's test on two similar 230 V machines, armature currents 37A and 30A; filed currents of 0.85 A and 0.8A. Calculate the efficiencies of machines if each has armature resistance of 0.33Ω. **(06 Marks)**

c. Calculate the torque exerted by an 8-pole, 50 Hz, 3-phase induction motor operating with a 4% slip which develops a maximum torque of 150 kg-m at a speed of 660 rpm. The resistance per phase of the rotor is 0.5Ω. **(05 Marks)**

Module-3

5 a. Discuss the various losses that take place in 3-phase induction motor. Explain briefly. **(05 Marks)**

b. Explain no load and blocked rotor tests conducted on 3-phase induction motors to construct circle diagram. **(06 Marks)**

c. Draw a neat sketch and explain the working of double cage induction motor. **(05 Marks)**

OR

6 a. Write a brief note on induction generator. **(04 Marks)**

b. Draw the circle diagram for a 20 HP, 50 Hz, 3-phase star connected induction motor with the following data:
No load test: 400 V, 9A, 0.2 PF
Blocked rotor test: 200 V, 50A, 0.4PF
Determine the line current and efficiency for full load condition. **(08 Marks)**

c. A 5 HP, 400V, 6-pole, 50 Hz, 3-phase induction motor operating at full load draws a line current of 7A at 0.866 PF with 2% slip. Find the rotor speed and efficiency of the motor. **(04 Marks)**

Module-4

7 a. Justify the necessity of starter for 3-phase induction motor. Explain star-delta starter with neat sketch. **(08 Marks)**

b. Explain with a neat sketch the construction and working principle of split phase induction motor. **(04 Marks)**

c. A 250 W, 230 V, 50 Hz single phase capacitor start induction motor has the following constants for the main and auxiliary windings. Main winding $Z_m = (4.5 + j3.7)\Omega$, auxiliary winding $Z_a = (9.5 + j3.5)\Omega$. Determine the value of the capacitor that will place the main and auxiliary winding currents in quadrature at starting. **(04 Marks)**

OR

8 a. Describe the different methods of speed control of three phase induction motors. **(06 Marks)**

b. Discuss with a neat sketch the working of DOL starter. **(05 Marks)**

c. Explain with a neat sketch the construction and working principle of capacitor start induction motor. **(05 Marks)**

Module-5

9 a. Write a brief note on V and inverted V curves of synchronous motor. **(06 Marks)**

b. List the applications of linear induction motor. **(04 Marks)**

c. Describe the different methods of starting synchronous motor. **(06 Marks)**

OR

10 a. Explain briefly why synchronous motors are not self starting. **(06 Marks)**

b. Write a brief note on AC series motor. **(04 Marks)**

c. Describe the phenomenon of hunting in synchronous machine. **(06 Marks)**

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CBCS SCHEME

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15EE45

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Given two vector combinations

$\vec{A}+\vec{B}=2\vec{a_x}+3\vec{a_y}-3\vec{a_z}$ and $\vec{A}-\vec{B}=4\vec{a_x}+\vec{a_y}+\vec{a_z}$. Find

i) The value of $\vec{A}$ and $\vec{B}$ in vector form

ii) Cross product of $\vec{A}$ and $\vec{B}$

iii) Dot product of $\vec{A}$ and $\vec{B}$ **(06 Marks)**

b. Given the Rectangular components of vector

$\vec{H}=20\vec{a_\rho}-10\vec{a_\phi}+3\vec{a_z}$ at point P(5, 2, −1) **(05 Marks)**

c. State and explain Coulomb's law in vector form. **(05 Marks)**

OR

2 a. State and explain Gauss law. Find electric field intensity at a distance 'r' from an infinite line charge using Gauss law. **(06 Marks)**

b. Given the electric flux density $\vec{D}=5\text{Sin}\,\theta\,\vec{a_\theta}+5\text{Sin}\,\phi\vec{a_\phi}$ at $P\left(0.5,\frac{\pi}{4},\frac{\pi}{4}\right)$. There exist spherical volume charge of radius 'a' with uniform charge density of ρ_v. Obtain electric field intensity as a function of radius r.verify Divergence theorem for r < a and r > a. **(08 Marks)**

c. State the relationship between rectangular and cylindrical corrdinates. **(02 Marks)**

Module-2

3 a. A charge of 10nc is located at $P_1(0, 0, 5)$ and another charge of −5nc at P_2 (0, 0, −5). Find the coordinate of point at which $\vec{E}$ is zero. **(06 Marks)**

b. Show that $\vec{E}$ is expressed as negative gradient of scalar potential. **(06 Marks)**

c. Calculate the numerical value of V and ρ_v in free space if $V=\frac{4yz}{x^2+1}$ at P(1, 2, 3). **(04 Marks)**

OR

4 a. Obtain the boundary condition between Dielectric and conductor. **(06 Marks)**

b. Derive current continuity Equation with usual notation. **(04 Marks)**

c. Find the Energy stored in free space for the region $2*10^{-3}\text{m} < r < 3*10^{-3}\text{m}$, $0<\theta<\frac{\pi}{2}, 0<\phi<\frac{\pi}{2}$. Given the potential field is $V=\frac{200}{r}$ volts. **(06 Marks)**

Module-3

5 a. Starting form point from of Gauss law derive Laplace equation and Poisson's equation. Also derive uniqueness theorem. **(08 Marks)**

b. Determine whether the given potential field satisfy Laplace equation V = r Cos ϕ + z. **(02 Marks)**

c. Assume the space between inner and outer conductors of co-axial cylindrical structure is filled with electron cloud having volume charge density $\rho_v = \frac{A}{r}$ for a < r < b, where a and b are radii of inner and outer conductor. The inner conductor is maintained at a potential of V_0 and outer conductor at ground. Determine the potential distribution in the region a < r < b. **(06 Marks)**

OR

6 a. Find magnetic field Intensity at point P for the circuit shown in Fig Q6(a). **(06 Marks)**

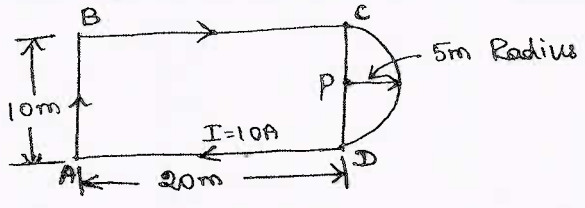

Fig Q6(a)

b. Distinguish Scalar Magnetic Potential and vector magnetic potential. Also prove that $A = \frac{\mu_0}{4\pi}\int_{vol}\frac{J}{r}\cdot dv$ **(06 Marks)**

c. State Biot Savart's law and Ampere's circuital law. **(04 Marks)**

Module-4

7 a. Derive an expression for force between two parallel conductors carrying a current of 'I' amps in opposite direction. **(07 Marks)**

b. Current flowing in conductor A and B are 500A and 800A respectively. Net force acting on conductor B is 2N/m. Find current in conductor C and also its direction. Refer the below Figure. [Fig Q7(b)]. **(06 Marks)**

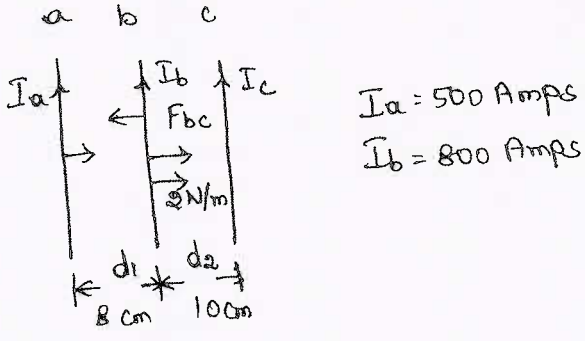

Fig Q7(b)

c. Obtain the Relation between J and ρ_v. **(03 Marks)**

OR

8 a. Obtain magnetic boundary condition if the boundary carries zero surface current. **(08 Marks)**

b. With neat sketch obtain and derive an expression for inductance of a co-axial cable. **(08 Marks)**

Module-5

9 a. List Maxwell's Equation for Time varying field in point form and Integral form. **(06 Marks)**

b. Starting from Ampere's circuital law derive and expression for Displacement current density for time varying fields. **(06 Marks)**

c. A conductor carries a steady current of 'I' amps. The components of current density vector $\vec{J}_x = 2ax$ and $\vec{J}_y = 2ay$. Find the third component $\vec{J}_z$. Derive any relation used. **(04 Marks)**

OR

10 a. A short vertical antenna erected on the surface of perfectly conducting earth produces effective field strength $E_{eff} = 100 \sin \theta$ mV/m at points at a distance of 1 mile from the antenna. Compute the poynting vector and total power radiated. **(08 Marks)**

b. A conductor of circular cross section of radius 'a' m and length 'ℓ' m carrying a current of I amps of conductivity σ. Find power loss in the conductor over the surface of cylindrical conductor carrying current of 'I' amps and show that it is equal to power loss in the conductor. **(08 Marks)**

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15EE46

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. With a neat block diagram, explain the general stages for an op-amp. **(08 Marks)**

b. Explain the effect of feedback as input resistance (R_i) and output resistance for voltage shunt amplifier. **(08 Marks)**

OR

2 a. Define the following terms :
i) input offset voltage
ii) input offset current
iii) PSRR
iv) CMRR. **(08 Marks)**

b. The circuit of peaking amplifier is to provide a gain of 10 at a peak frequency of 16KHz. Determine the value of all components. **(08 Marks)**

Module-2

3 a. Using a 741 op-amp, design the first order active low pass filter to have a 1.0 KHz cut off frequency. **(06 Marks)**

b. Sketch the circuit of a second order active low pass active filter and explain its operation. **(10 Marks)**

OR

4 a. For a voltage regulator define.
i) Line regulation
ii) Load regulation
iii) Ripple rejection. Write equation for each. **(06 Marks)**

b. Explain the working and design to op-amp voltage follower regulator. **(10 Marks)**

Module-3

5 a. Draw the circuit diagram of a triangular/rectangular waveform generator using op-amps. Sketch the circuit waveforms and explain its circuit operation. **(10 Marks)**

b. Design a triangular waveform generator to produce a ±2V 1KHz output. Use a ±15V supply assume $I_1 = 100\mu A$. **(06 Marks)**

OR

6 a. Explain the working of Schmitt trigger in inverting mode. Draw its hysterisis curve. **(06 Marks)**

b. State the Barkhauses criteria for a sine wave oscillator. Draw the circuit diagram of an op-amp phase shift oscillator. Sketch the circuit wave forms and briefly explain the oscillator operation. **(10 Marks)**

Module-4

7 a. Show how a half wave precision rectifier can be obtained with a summing circuit to produce a full wave precision rectifier. Draw the voltage wave forms and write the equation to show that full-wave rectification is performed. **(10 Marks)**

b. Explain the working of R-2R ladder DAC. Assume that binary input is 001. **(06 Marks)**

OR

8 a. Design a precision full wave rectifier circuit to produce a 2V peak output from a sinewave input with a 0.5Vp value and 1MHz frequency. Use bipolar op-amp with a supply voltage of ±15V. Assume I_i = 500μA. **(08 Marks)**

b. Sketch an op-amp precision clamping circuit draw the input and output waveforms and explain the circuit operation. Show how the output voltage can be biased to any desired level. **(08 Marks)**

Module-5

9 a. Draw the basic block diagram and waveforms for a PLL system. Identify each component part and explain its function. **(08 Marks)**

b. Draw the block diagram for a PLL frequency synthesizer. Sketch all waveforms and explain the system operation. **(08 Marks)**

OR

10 a. Sketch the basic circuit diagram of an astable multivibrator using 555 timer with two resistances and a capacitor. Show the capacitor and output waveforms and explain the circuit operation. **(08 Marks)**

b. Sketch the functional block diagram for a 555 IC timer. Identify all terminals and explain each component part. **(08 Marks)**

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CBCS SCHEME

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17EE32

Third Semester B.E. Degree Examination, June/July 2019
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. Find the input impedance Z_{in} for the network shown in Fig.Q.1(a) **(06 Marks)**

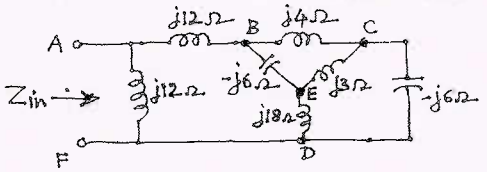


Fig.Q.1(a)

b. Construct the exact dual of the network N_1 shown in Fig.Q.1(b) using dot method. **(08 Marks)**

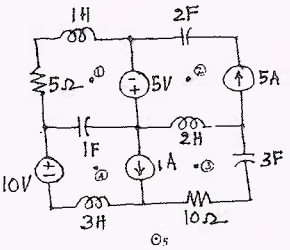


Fig.Q.1(b)

c. Find the loop currents i_1, i_2 and i_3 using Mesh analysis for the network shown in Fig.Q.1(c) **(06 Marks)**

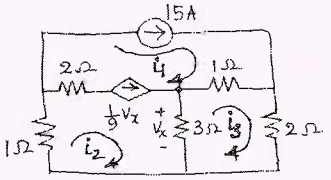


Fig.Q.1(c)

OR

2 a. Write a system of nodal equations for the circuit of Fig.Q.2(a) using the nodal voltages V_1 and V_2 as the variables. What power is furnished by the dependent sources? **(10 Marks)**

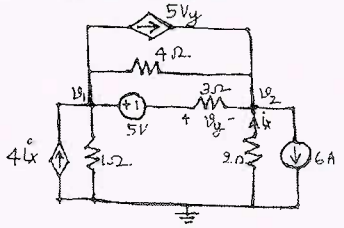


Fig.Q.2(a)

b. Find the voltage across the 5Ω resistor of Fig.Q.2(b) using source transformation technique. **(06 Marks)**

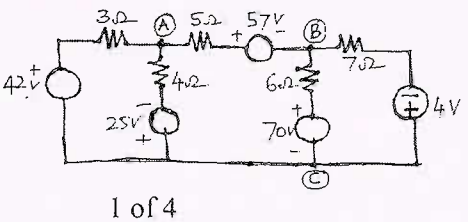
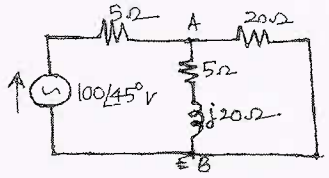


Fig.Q.2(b)

c. For the network shown in Fig.Q.2(c). Find the voltage V_{AB} using the nodal method. **(04 Marks)**

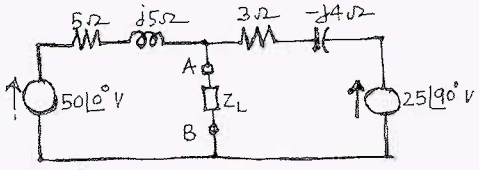
Fig.Q.2(c)



Module-2

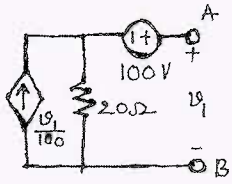
3 a. In the network shown in Fig.Q.3(a) two voltage sources act on the lead impedance connected to the terminals AB. If this load is variable in both reactance and resistance, what load Z_L will receive maximum power? What is the value of this maximum power? **(06 Marks)**

Fig.Q.3(a)



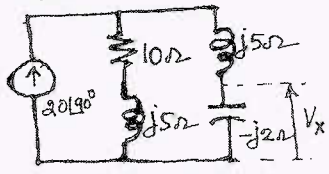
b. For the network shown in Fig.Q.3(b), find the Thevenin's equivalent network across the terminals A and B. **(08 Marks)**

Fig.Q.3(b)



c. In the network shown in Fig.Q.3(c), determine the voltage 'V_x'. Then apply the reciprocity theorem and compare the two voltages. **(06 Marks)**

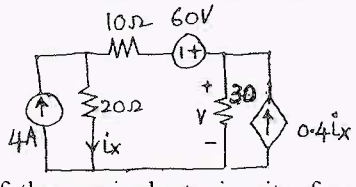
Fig.Q.3(c)



OR

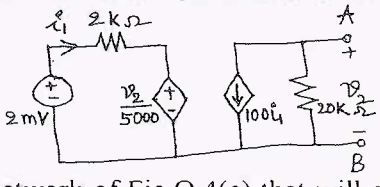
4 a. Use superposition theorem to find voltage 'V' in the network shown in Fig.Q.4(a) **(06 Marks)**

Fig.Q.4(a)



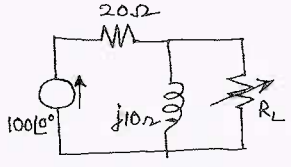
b. Fid.Q.4(b) shows one form of the equivalent circuit of a transistor amplifier. Obtain its Thevenin's equivalent network across the output terminals 'A' and 'B'. **(08 Marks)**

Fig.Q.4(b)



c. Find the value of R_L of the network of Fig.Q.4(c) that will absorb a maximum power and specify the value of that power. **(06 Marks)**

Fig.Q.4(c)

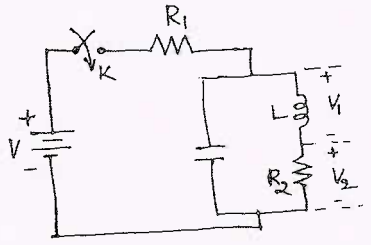


Module-3

5 a. A series RLC circuit has $Q_0 = 5.1$ at its resonant frequency of 100kHz. Assuming the power dissipation of the circuit is 100W when drawing a current of 0.8A, find: i) R,L,C ii) Band width (Δf) of the circuit and iii) Half-power frequencies. **(08 Marks)**

b. Fig.Q.5(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 $\frac{dv_2}{dt}$ at $t = 0^+$ iii) $\frac{d^2v_2}{dt^2}$ at $t = 0^+$ **(12 Marks)**

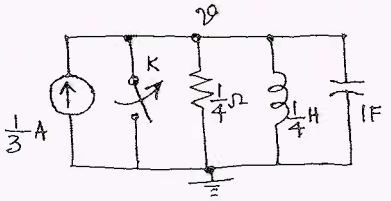
Fig.Q.5(b)



OR

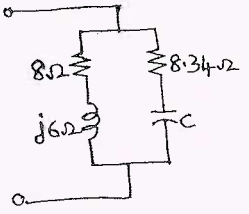
6 a. Fig.Q.6(a) shows a RLC parallel circuit excited by a dc current source. At t = 0, the switch 'K' is opened. Find v(t). **(12 Marks)**

Fig.Q.6(a)



b. For the circuit of Fig.Q.6(b), find the value of capacitance so that the circuit resonates at $W_0 = 5K$ rad/s. **(08 Marks)**

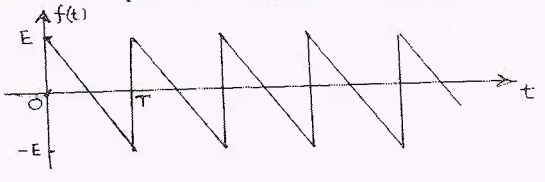
Fig.Q.6(b)



Module-4

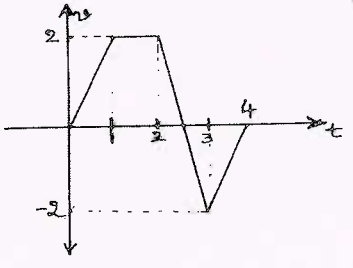
7 a. Find the Laplace transform of the periodic Saw tooth wave shown in Fig.Q.7(a). **(12 Marks)**

Fig.Q.7(a)



b. Find the Laplace transform for the wave form shown in Fig.Q.7(b). **(08 Marks)**

Fig.Q.7(b)

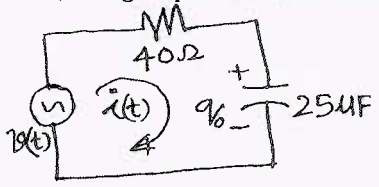


OR

8 a. State and prove initial – value and final – value theorems in Laplace transformation. **(10 Marks)**

b. Fig.Q.8(b) shows an R-C circuit excited by a sinusoidal voltage V(t) = 200 sin (2000t + ϕ). The capacitor has an initial charge of 1.25×10^{-3}C with polarity as shown. Find the current if the circuit is switched on at ϕ = 90°, using Laplace transformation technique. **(10 Marks)**

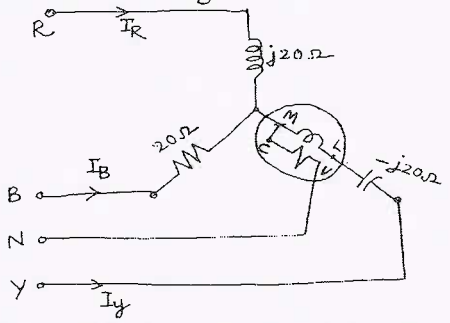
Fig.Q.8(b)



Module-5

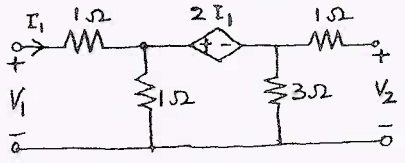
9 a. Find the reading on the Wattmeter in Fig.Q.9(a) when the circuit is connected to a 400V, 3-ϕ supply. The phase sequence is RYB. Neglect Wattmeter losses. **(10 Marks)**

Fig.Q.9(a)



b. Obtain the y-parameters of the circuit shown in Fig.Q.9(b). Find its equivalent circuit using y-parameters and find whether the network is i) reciprocal ii) symmetrical. **(10 Marks)**

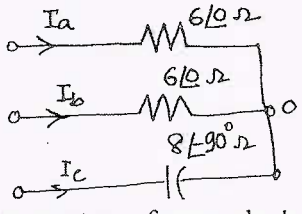
Fig.Q.9(b)



OR

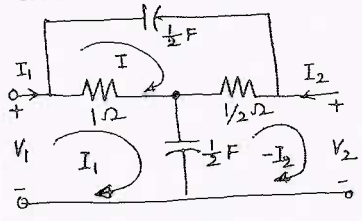
10 a. In a 3-phase 3-wire 400 ∠0° system abc, loads 6∠0°, 6∠0° and 8∠-90° Ω are connected to phases a, b, c respectively as shown in Fig.Q.10(a). Find : i) Line currents and ii) Voltage V_{ao}, V_{bo} and V_{co}. **(10 Marks)**

Fig.Q.10(a)



b. Find the transmission or ABCD parameters of network shown in Fig.Q.10(b). Find whether the network is i) Reciprocal ii) Symmetrical. **(10 Marks)**

Fig.Q.10(b)



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17EE33

Third Semester B.E. Degree Examination, June/July 2019
Transformer and Generator

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain operation of practical transformer on no load along with neat phasor diagram. **(07 Marks)**

b. With neat circuit diagram, discuss in detail how to perform OC and SC tests on single phase transformer. **(08 Marks)**

c. Define voltage regulation of two winding transformer and derive condition for zero voltage regulation. **(05 Marks)**

OR

2 a. What is V-V connection? State the merits and demerits of V-V (open delta) connection. **(07 Marks)**

b. Find all day efficiency of single phase transformer having maximum efficiency for 98% at 15KVA at UPF (Unity Power Factor) and loaded as follows:
12 hours – 2kW at 0.5 power factor lagging
6 hours – 12kW at 0.8 power factor lagging
6 hours – No load. **(08 Marks)**

c. State the advantages of single three phase transformer over bank of single phase transformer. **(05 Marks)**

Module-2

3 a. Two single phase transformer with equal voltage ratio connected in parallel, share a load of 400kVA at power factor of 0.8lag. Their equivalent impedance referred to secondary winding are (1+j2.5) Ω and (1.5 + j3) Ω respectively. Calculate the load shared by each transformer. **(07 Marks)**

b. With neat circuit diagram, explain in detail how to perform Sumpner's test. **(08 Marks)**

c. Mention the need and necessary conditions for parallel operation of two single phase transformer. **(05 Marks)**

OR

4 a. What is autotransformer? State advantages and disadvantages of autotransformer. **(07 Marks)**

b. Derive an expression for saving of copper when an autotransformer is used and also mention its applications. **(08 Marks)**

c. With neat diagram, describe off circuit tap changing transformer. **(05 Marks)**

Module-3

5 a. A 6 pole, 150 armature current dc shunt generator has 480 conductors and is wave wound. Find demagnetizing and cross magnetizing ampere turns/pole at full load if.
   i) Brushes are at the geometrical neutral axis (GN.A)
   ii) Brushes are shifted from GN.A by 5° electrical
   iii) Brushes are shifted from GN.A by 5° mech. **(07 Marks)**

   b. What is commutation? Explain practical commutation with neat diagram of DC machine. **(08 Marks)**

   c. What is three winding transformer? How the stabilization is achieved due to tertiary winding. **(05 Marks)**

OR

6 a. Discuss comparison between the following in alternator
   i) Single layer and double layer windings
   ii) Full pitch and fractional pitch coils. **(07 Marks)**

   b. What is armature reaction? With neat figures explain armature reaction in machine under normal working conditions. **(08 Marks)**

   c. Derive emf equation of alternators. **(05 Marks)**

Module-4

7 a. What is synchronization of alternators? State the necessary condition for synchronization. How three phase alternators are synchronized? **(10 Marks)**

   b. With neat circuit diagram, explain how to perform slip test on salient pole synchronous machine and indicate how X_d and X_q can be determined. **(10 Marks)**

OR

8 a. What is synchronoscope? How it is used for synchronization of alternators? **(07 Marks)**

   b. A 400V, 50Hz delta connected alternator has a direct axis reactance of 0.1Ω and q quadrature axis reactance of 0.07Ω per phase. The armature resistance is negligible. The alternator is supplying 1000A at 0.8pf lagging p.f. i) Find excitation emf neglecting saliency and assuming $X_d = X_q$; ii) Find the excitation emf taking into account the saliency. **(08 Marks)**

   c. Write a short note on V-curves on synchronous generator. **(05 Marks)**

Module-5

9 a. With neat circuit diagram, explain in detail how to perform zero power factor test and use potier reactance to determine regulation. **(10 Marks)**

   b. The effective resistance of 2.2kV, 50Hz, 440kVA, single phase alternator is 0.5Ω. on short circuit a field current of 40Amp gives a full load current of 200A. The emf on open circuit with the same field excitation is 1.16 KV. Find the value of synchronous impedance and find the voltage regulation at full load and i) Unity power factor ii) 0.8pf lag. **(10 Marks)**

OR

10 a. What is short circuit ratio? Explain the significance of SCR. **(07 Marks)**

   b. Write a short note on capability curves of synchronous generator. **(08 Marks)**

   c. What is hunting in synchronous machine? Explain the role of damper winding. **(05 Marks)**

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17EE34

Third Semester B.E. Degree Examination, June/July 2019
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. With a neat circuit diagram, explain Emitter stabilized bias circuit, write the necessary equation. **(08 Marks)**

b. Determine output voltage for the following circuit in Fig.Q.(b). Assume f = 1000Hz and ideal diode. **(06 Marks)**

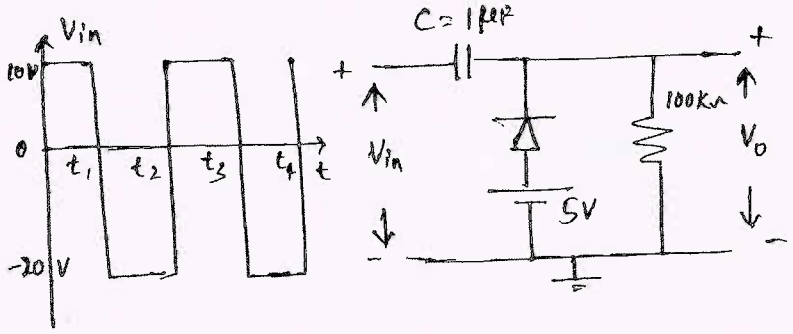

Fig.Q.1(b)

c. Derive the expression for stability factors of fixed bias circuit with respect to I_{CO}, V_{BE}, β and draw the circuit diagram. **(06 Marks)**

OR

2 a. Explain the circuit of a transistor switch being used as an inverter. **(06 Marks)**

b. Determine the voltage V_{CE} and the current I_C for the voltage divider configuration Given: $R_1 = 39K\Omega$, $R_2 = 3.9K\Omega$, $R_C = 10K\Omega$, $R_E = 1.5K\Omega$, $C_E = 50\mu F$, B = 100, $V_{BE} = 0.7$. **(08 Marks)**

c. Sketch the output waveform for the network shown in Fig.Q.2(c). If the peak value of the a.c input if 15V and draw the transfer characteristics. **(06 Marks)**

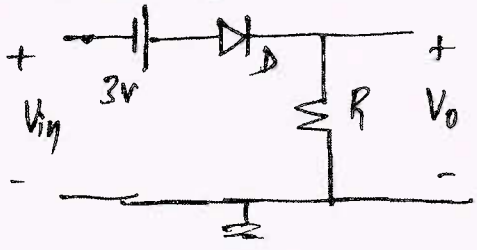

Fig.Q.2(c)

Module-2

3 a. With a neat circuit diagram, derive an expression for Z_i, Z_o and A_v of fixed bias circuit using r_e – model. **(08 Marks)**

b. For the Emitter follower network shown in Fig.Q.3(b). Determine r_e, Z_i, Z_o and A_v. **(06 Marks)**

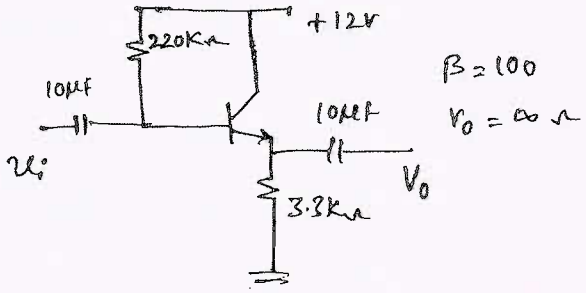

Fig.Q.3(b)

c. Prove that Miller effect of input capacitance $C_{Mi} = (1-A_v)C_f$ and output capacitance $C_{Mo} = \left(1 - \frac{1}{A_v}\right)C_f$. **(06 Marks)**

OR

4 a. For the following circuit determine Z_i, Z_o, A_v, A_i $h_{fb} = -0.99$, $h_{ib} = 14.3\Omega$. **(08 Marks)**

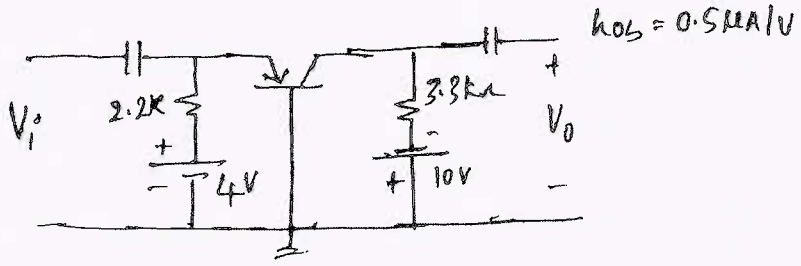

Fig.Q.4(a)

b. What are the advantages of h-parameters? **(06 Marks)**

c. Define h-parameters and obtain h-parameter equivalent circuit of CE configuration. **(06 Marks)**

Module-3

5 a. Obtain expression for voltage gain, current gain, input and output impedance of a Darlington Emitter follower circuit. Draw necessary equivalent circuit. **(12 Marks)**

b. With a neat block diagram, obtain expression for Z_{if} and Z_{of} for voltage series feedback amplifier. **(08 Marks)**

OR

6 a. Explain the general characteristics of negative feedback amplifier. **(08 Marks)**

b. Explain the need of cascading amplifier. A given amplifier arrangement has the following gains. $Av_1 = 10$, $Av_2 = 20$ and $Av_3 = 40$. Calculate overall voltage gain and total voltage gain in dB. **(06 Marks)**

c. With a simple block diagram, explain the concept of feedback amplifier. **(06 Marks)**

Module-4

7 a. With a neat circuit diagram, explain the operation of a class B push pull power amplifier and maximum conversion efficiency is 78.5%. **(08 Marks)**

b. With a neat circuit diagram, explain the operation of RC-phase shift oscillator using BJT and write f_{ose} equation. **(06 Marks)**

c. A series fed class A amplifier as shown in Fig.Q.7(c). Operates from a DC source and applied sinusoidal input signal generates peak base current 9mA. Calculate I_{CQ}, V_{CEQ}, P_{dc}, P_{ac} and efficiency. **(06 Marks)**

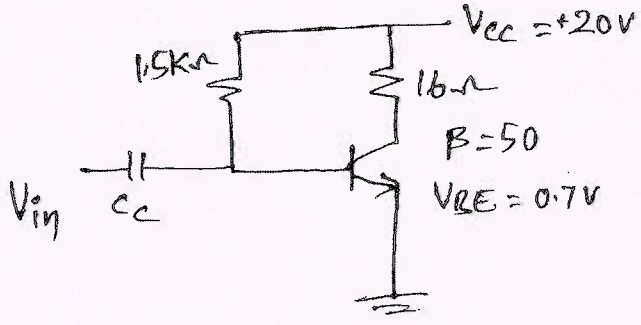

Fig.Q.7(c)

OR

8 a. The frequency selective circuit arms of wein bridge oscillator uses $C_1 = C_2 = 0.001\mu F$, $R_1 = 10K\Omega$ while R_2 is kept variable. The frequency is to be varied from 10Hz to 50kHz by varying R_2. Find the range of R_2. **(06 Marks)**

b. With a neat circuit diagram, explain the operation of a transformer coupled class A power amplifier and prove that conversion efficiency is 50%. **(08 Marks)**

c. With a neat circuit diagram, explain the working principle of crystal oscillator in series resonant mode. **(06 Marks)**

Module-5

9 a. Explain the operation of JFET amplifier using fixed bias. Draw the JFET small signal model and derive the expression for Z_i, Z_o and A_v. **(06 Marks)**

b. Explain the construction, working and characteristics of n-channel enhancement type MOSFET. **(08 Marks)**

c. Determine the following for network shown in Fig.Q.9(c) V_{GSQ}, V_{DS}, V_S, V_G, V_D. **(06 Marks)**

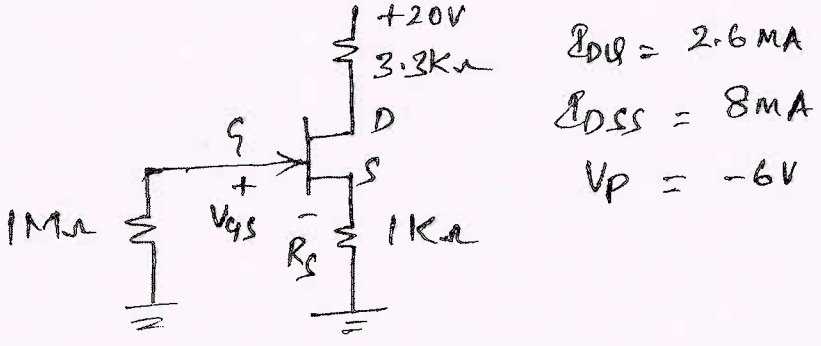

Fig.Q.9(c)

OR

10 a. Compare FET over BJT. **(06 Marks)**

b. With a neat diagrams, Explain the construction, working and characteristics of n-JFET's. **(08 Marks)**

c. Design the fixed bias network as shown in Fig.Q.10(c) having an a.c. gain of 10. Determine the value of R_D. **(06 Marks)**

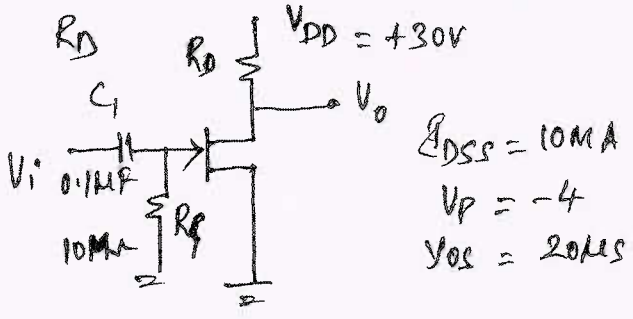

Fig.Q.10(c)

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17EE35

Third Semester B.E. Degree Examination, June/July 2019
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. What is a K-map? Which is the code used to number K-map and why? Write a neat numbered 4-variable K-map. **(06 Marks)**

b. Using K-map, evaluate the minimal POS expression of,
$f(a, b, c, d) = \pi M(0, 2, 4, 6, 8) \cdot \pi D(1, 9, 12, 15)$ **(08 Marks)**

c. Evaluate the minimal SOP expression using VEM with 'Z' as MEV.
$f(w, x, y, z) = \sum m(0, 3, 5, 7, 8, 9, 10, 12, 13) + \sum d(1, 6, 11, 14)$ **(06 Marks)**

OR

2 a. What is don't care condition? What are its advantages? **(04 Marks)**

b. Evaluate the canonical SOP expression and hence determine the minimal expression using K-map $F = A\overline{B}\overline{D} + \overline{A}B + \overline{A}C + CD$. **(08 Marks)**

c. Minimize the following SOP expression using Quine McCluskey method:
$f(w, x, y, z) = \sum m(3, 7, 8, 10, 11, 12, 14, 15) + \sum d(2, 6)$ **(08 Marks)**

Module-2

3 a. With a neat diagram, explain the operation of a carry look-ahead adder circuit. **(10 Marks)**

b. Implement the following Boolean function using a 4:1 MUX with a and b as select inputs.
$f(a, b, c, d) = \sum m(4, 5, 7, 8, 10, 12, 15)$ **(06 Marks)**

c. Implement a 2 to 4 decoder using 1 to 2 decoders. **(04 Marks)**

OR

4 a. Design a full adder using 4:1 MUX. **(06 Marks)**

b. Implement a 1-bit comparator using a suitable decoder. **(06 Marks)**

c. With a logic diagram, explain the operation of a decimal to BCD priority encoder. **(08 Marks)**

Module-3

5 a. Explain the operation of an SR latch with a circuit diagram and characteristic table. Justify its application as switch debouncer with a relevant circuit and waveforms. **(08 Marks)**

b. Design a 4-bit shift register using DFFs. Design a twisted ring counter using a 4-bit shift register. **(06 Marks)**

c. Design a mod-11 up ripple counter using TFF. **(06 Marks)**

OR

6 a. What is the problem in SRFF? How is it eliminated in JKFF? Explain with a neat diagram. **(06 Marks)**

b. With a neat logic diagram, explain the different modes of operation of universal shift register. **(07 Marks)**

c. Design a synchronous counter using JKFF with counting sequence 0, 2, 6, 1, 3, 7, 0.... **(07 Marks)**

Module-4

7 a. List out the merits and demerits of synchronous sequential circuit asynchronous sequential circuits. **(04 Marks)**

b. Design a clocked synchronous sequential circuit that operates according to the state diagram shown in Fig.Q7(b). Use DFF in the circuit.

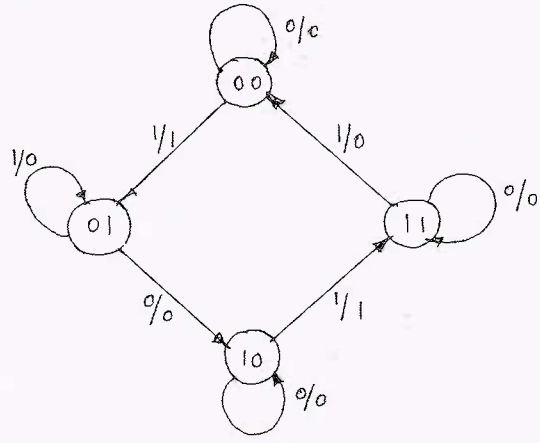

Fig.Q7(b) **(10 Marks)**

c. Analyze the following sequential circuit and obtain: [Fig.Q7(c)]
i) FF input and output equations ii) Transition table
iii) State table iv) State diagram

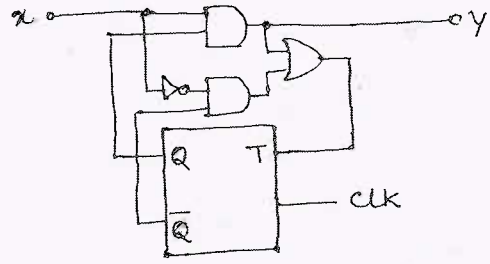

Fig.Q7(c) **(06 Marks)**

OR

8 a. Compare and contrast Mealy and Moore synchronous sequential networks with neat block diagrams. **(04 Marks)**

b. A sequential network has one input and one output. The state diagram is as shown in Fig.Q8(b). Design the sequential network using TFF.

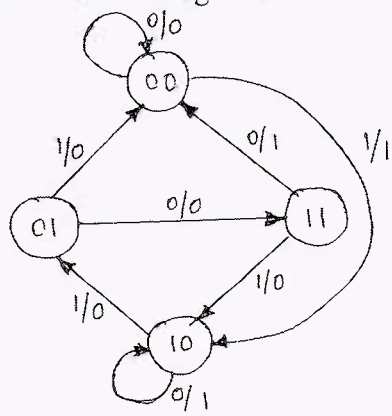

Fig.Q8(b) **(10 Marks)**

c. An edge triggered DFF is connected as shown in Fig.Q8(c). Assuming Q = 0 initially, sketch the output waveform and determine the frequency of the output signal.

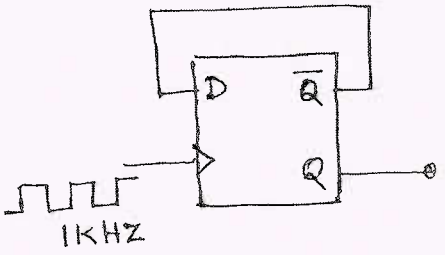

Fig.Q8(c) **(06 Marks)**

Module-5

9 a. Explain entity and architecture with reference to VHDL code of full adder circuit. **(08 Marks)**

b. Write VHDL code to implement 2:1 MUX. **(06 Marks)**

c. List out all operators in VHDL with examples. **(06 Marks)**

OR

10 a. Explain various data types supported in VHDL with examples. **(08 Marks)**

b. Implement a 1-bit comparator either using VHDL code or verilog. **(04 Marks)**

c. Implement a JKFF with active low asynchronous inputs $\overline{pr}$ and $\overline{clr}$ along with clock input using verilog/VHDL. **(08 Marks)**

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15EE32

Third Semester B.E. Degree Examination, June/July 2019
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. Write a system of modal equations for the circuit of Fig.Q1(a) using the nadal voltages v_1 and v_2 as the variables. What power is furnished by the 5Vy dependent source? **(10 Marks)**

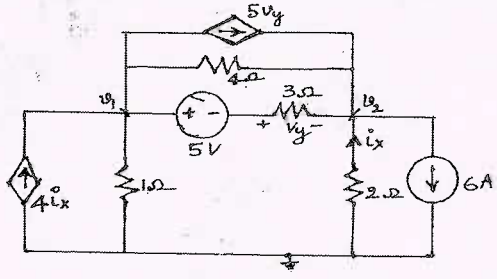

Fig.Q1(a)

b. Find Req for the network shown in Fig.Q1(b) below at points BC. **(06 Marks)**

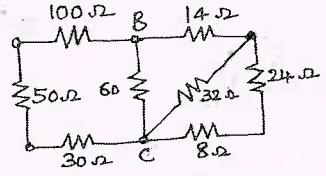

Fig.Q1(b)

OR

2 a. In the network of Fig.Q2(a) determine v_2 such that the current in the impedance (2 + j3) is zero. Use Mesh analysis. **(06 Marks)**

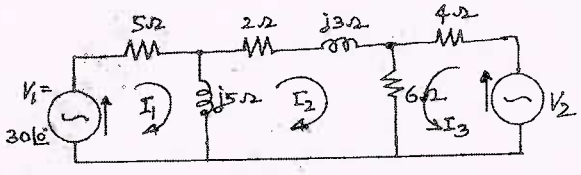

Fig.Q2(a)

b. A tank circuit is supplied by a current source whose source resistance is 56 kΩ. The tank circuit is composed of a 56 nF capacitor in parallel with a coil whose inductance and resistance are 35 mH and 80 Ω respectively. Find (i) Input impedance at resonance (ii) Quality factor of the circuit and (iii) Half power frequencies (f_1 & f_2). **(10 Marks)**

Module-2

3 a. Determine the current in R = 1 Ω resistor of the network shown in Fig.Q3(a) using Thevenin's and Superposition theorem simultaneously. **(10 Marks)**

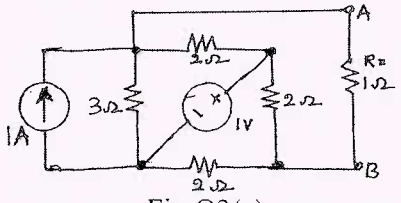

Fig.Q3(a)

b. In the network shown in Fig.Q3(b) determine the voltage 'V_x'. Then apply the reciprocity theorem. And compare two voltages. **(06 Marks)**

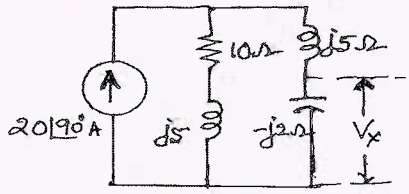

Fig.Q3(b)

OR

4 a. Obtain the Thevenin's equivalent network across the output terminals 'A' and 'B' of the network shown in Fig.Q4(a). **(10 Marks)**

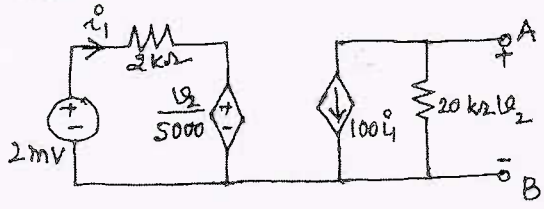

Fig.Q4(a)

b. Use Millman's theorem to find the current I through $R_4 = 5\ \Omega$ in the network shown in Fig.Q4(b). **(06 Marks)**

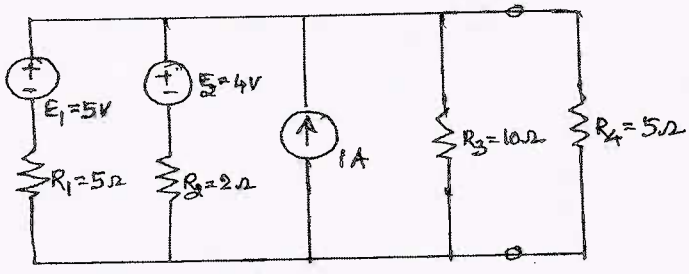

Fig.Q4(b)

Module-3

5 a. Fig.Q5(a) 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 $\frac{dv_2}{dt}$ at $t = 0^+$. **(10 Marks)**

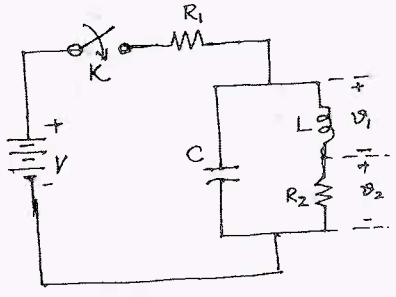

Fig.Q5(a)

b. Fig.Q5(b) shows a RLC series circuit excited by a dc voltage source. At t = 0 the switch K is closed. Find i(t). **(06 Marks)**

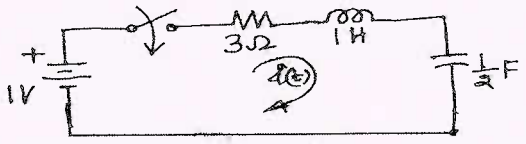

Fig.Q5(b)

OR

6 a. Fig.Q6(a) shows a RLC parallel circuit excited by a dc current source. At t = 0, the switch 'K' is opened. Find V(t). **(08 Marks)**

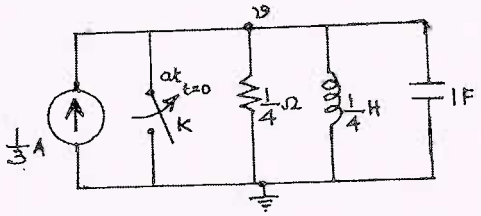

Fig.Q6(a)

b. The network shown in Fig.Q6(b) is in the steady state with the switch 'K' is closed. At t = 0, the switch is opened. Determine the voltage across the switch V_k and $\frac{dV_k}{dt}$ at t = 0 .

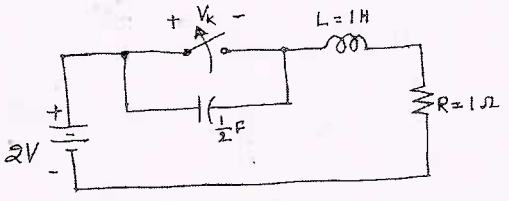

Fig.Q6(b) **(08 Marks)**

Module-4

7 a. In the RL series circuit shown in Fig.Q7(a), the switch K is closed at t = 0. Solve for the current i(t), using the Laplace transform method. **(08 Marks)**

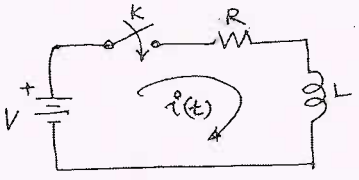

Fig.Q7(a)

b. State and prove (i) initial value theorem and (ii) final value theorem as applied to Laplace Transform. What are the limitations of each theorem? **(08 Marks)**

OR

8 a. Find the Laplace transform of the periodic sawtooth wave shown in Fig.Q8(a). **(08 Marks)**

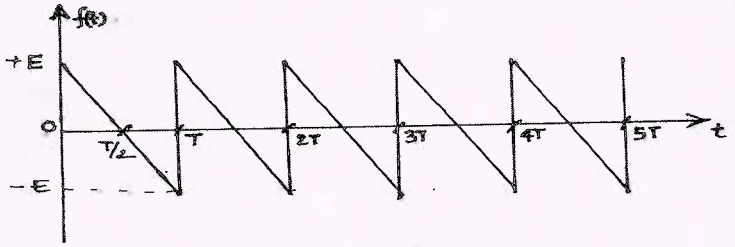

Fig.Q8(a)

b. The waveform shown in the Fig.Q8(b) is non-recurring. Write an equation for this waveform v(t). **(08 Marks)**

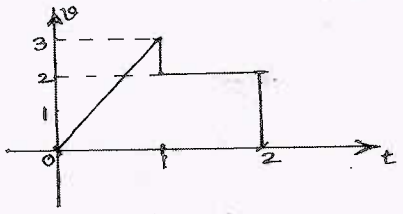

Fig.Q8(b)

Module-5

9 a. Find the Z-parameters for the circuit shown in Fig.Q9(a). Draw the Z-parameters equivalent circuit and find whether the network is (i) reciprocal and (ii) symmetrical. **(08 Marks)**

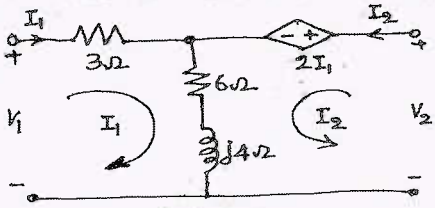

Fig.Q9(a)

b. For the RC network shown in Fig.Q9(b), find the driving point input impedance Z_{11}. Plot the pole-zero plot of this network function. **(08 Marks)**

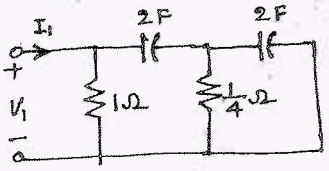

Fig.Q9(b)

OR

10 a. Find the (i) Phase currents (ii) Line currents (iii) Total active and reactive power for the three phase load shown in Fig.Q10(a). Draw the phasor diagram showing all the voltages and currents. Take V_{ac} as reference phasor. acb is the phase sequence and line voltage is 100 V. **(08 Marks)**

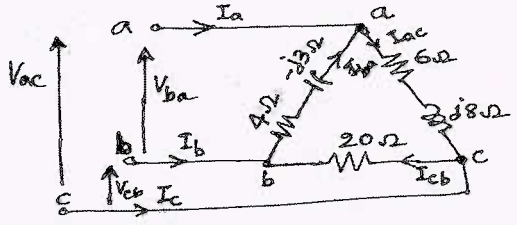

Fig.Q10(a)

b. A voltage wave v = 141.4 sinw_1t + 35.35 sin(3w_1t + 30°) – 14.14sin(5w_1t – 30°) is applied to the circuit shown in Fig.Q10(b). Find (i) Expression for current wave (ii) rms value of current and (iii) total power dissipated in the circuit. The reactances shown in Fig.Q10(b) are for fundamental frequency. **(08 Marks)**

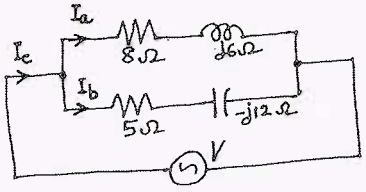

Fig.Q10(b)

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CBCS SCHEME

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15EE33

Third Semester B.E. Degree Examination, June/July 2019
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. Explain the operation of practical transformer on load with the help of phasor diagram. **(06 Marks)**

b. Mention the advantages of bank of three single phase transformers used as three phase transformers. **(04 Marks)**

c. A 5kVA, 500/250V, 50Hz, SPH transformer gave following readings:
O.C. test : 500V, 1A, 50W [LV side open]
SC test : 25V, 10A, 60W [LV side shorted]
Determine: i) Efficiency on full load, 0.8 lagging pf ; ii) Voltage regulation on full load, 0.8 leading pf. **(06 Marks)**

OR

2 a. With a neat circuit diagram of phasor diagra, explain the operation of 3ph transformer connected in star-star. **(04 Marks)**

b. Explain with a neat circuit diagram, how to convert a 3 phase supply to 2 phase supply. **(06 Marks)**

c. Find the all day efficiency of 15kVA, single phase transformed having maximum efficiency of 98% at 15kVA, UPF and loaded as follows:
12 hours – 2kW @ 0.5 pf
6 hours – 12kW @ 0.8 pf
6 hours – No load. **(06 Marks)**

Module-2

3 a. What is an auto transformer? Derive an expression for the saving of copper in an autotransformer compared to two winding transformer. **(08 Marks)**

b. What is the necessity of parallel operation of 8 two single phase transformers? Derive an expression for the current shared by two transformers connected is parallel sharing a common load when no load voltage of both transformer are equal. **(08 Marks)**

OR

4 a. Write short note on 3 phase auto transformer. **(06 Marks)**

b. List out the necessary condition to be satisfied for the parallel operation of two single phase transformers. **(04 Marks)**

c. Explain with a neat diagram, operation of OFF CIRCUIT Tap-changing Transform. **(06 Marks)**

Module-3

5 a. With a neat circuit diagram, explain in detail Sumpner's test for determining the efficiency of a transformer. Mention its advantages and disadvantages. **(08 Marks)**

b. Define armature reaction. With neat figure, explain armature reaction in DC machines. **(08 Marks)**

OR

6 a. Briefly explain the current inrush in transformers. **(05 Marks)**

b. What is commutation? With a neat diagram, explain the process of practical commutation in DC machines. **(06 Marks)**

c. A 3ϕ, 16 pole, star connected alternator has 144 slots having 10 conductor/slot. The flux/pole is 30mWb and distributed sinusoidal and the speed is 375 rpm. Find the Emf [line] for i) Full pitched winding ii) Short pitched by 1 slot. **(05 Marks)**

Module-4

7 a. With a neat circuit diagram, explain the slip test on salient pole synchronous machine and indicate how X_d, X_q and Voltage regulation is calculated. **(08 Marks)**

b. Write short notes on power angle characteristics of a synchronous machines. **(04 Marks)**

c. Explain the behaviour of synchronous generator on constant load and variable excitation with a neat phasor diagram. **(04 Marks)**

OR

8 a. With a phasor diagram, explain the concept of two reaction theory in a salient pole synchronous machine. **(08 Marks)**

b. Define voltage regulation of an alternator and explain the load characteristics of an alternator. **(05 Marks)**

c. Briefly explain the necessary conditions to be satisfied to synchronize the given alternator to infinite bus. **(03 Marks)**

Module-5

9 a. Write short note on hunting and dampers. **(06 Marks)**

b. Name various methods of determining the voltage regulation of an alternator. Explain ZPF method to determine the regulation of an alternator. **(10 Marks)**

OR

10 a. Write short note on short circuit ratio and its significance. **(06 Marks)**

b. The OC and SC test readings for a 3ϕ, star connected 1000 kVA, 2000V, 50Hz alternator are:

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

The armature effective resistance is 0.2Ω/ph. Draw the characteristic curves and estimate the full load regulation for i) 0.8pf lag ii) 0.8pf lead. **(10 Marks)**

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15EE34

Third Semester B.E. Degree Examination, June/July 2019
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. For the circuit shown in Fig.Q1(a), sketch the output waveforms and transfer characteristics for cut in voltage = 0.7V. **(08 Marks)**

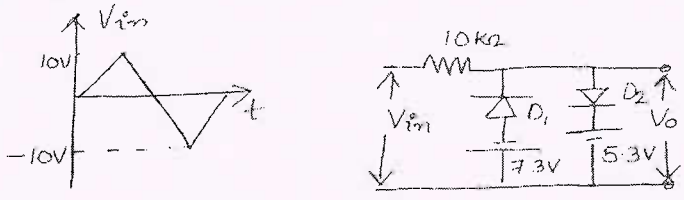

Fig.Q1(a)

b. Derive an expression for I_B, I_C, V_{CE} for voltage divider bias using exact analysis. **(08 Marks)**

OR

2 a. In a voltage divider bias circuit of BJT. $R_C = 4K\Omega$, $R_E = 1.5K\Omega$, $R_1 = 39K\Omega$, $R_2 = 3.9K\Omega$, $V_{CC} = 18V$ and $\beta = 70$. Find I_{CQ} and V_{CEQ}. **(08 Marks)**

b. Explain the operation of transistor as switch along with suitable circuit and necessary waveforms. Highlight the design procedure. **(08 Marks)**

Module-2

3 a. Define h-parameters and hence derive h-parameter model of a CE – BJT. **(06 Marks)**

b. State and prove Miller's theorem. **(04 Marks)**

c. For the network shown in Fig.Q3(c), determine r_e, Z_i, Z_0, A_V and A_I. **(06 Marks)**

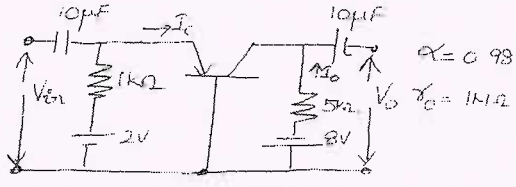

Fig.Q3(c)

OR

4 a. Determine the high frequency response of the amplifier circuit shown in Fig.Q4(a). Draw the frequency response curve.

$\beta = 100$, $C_{be} = 20pF$, $C_{bc} = 4pF$, $h_{ie} = 1100$, $C_{wi} = 6pF$, $C_{WO} = 8pF$, $C_{CC} = 1pF$. **(08 Marks)**

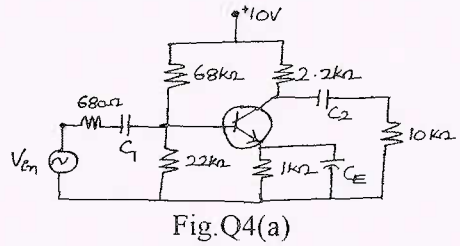

Fig.Q4(a)

b. Describe Miller effect and derive an equation for miller input and output capacitances. **(08 Marks)**

Module-3

5 a. Derive an expression for Z_i, A_V and A_I for Darlington emitter follower circuit. **(08 Marks)**

b. Explain the block diagram of a feedback amplifier. **(08 Marks)**

OR

6 a. List the general characteristics of negative feedback amplifier and derive the expression for gain with negative feedback. **(08 Marks)**

b. Derive the expression of R_{if} and R_{of} for voltage series feedback amplifier. **(08 Marks)**

Module-4

7 a. Explain the operation of a Class B push pull amplifier and show that its conversion efficiency is 78.5%. **(08 Marks)**

b. What is Brakhansen criteria for sustained oscillation? Explain basic principle of operation of oscillators. **(08 Marks)**

OR

8 a. Prove that the maximum conversion efficiency of class A transformer coupled amplifier is 50%. **(08 Marks)**

b. The harmonic distortion component in a power amplifier is $D_2 = 0.1$, $D_3 = 0.02$, $D_4 = 0.01$. The fundamental current amplitude is 4A and it supplies a load of 8Ω. Find total harmonic distortion, fundamental power and total power. **(08 Marks)**

Module-5

9 a. Draw the circuit of common source amplifier using JFET with the help of small signal model and derive an expression for input impedance, voltage gain and output impedance. **(08 Marks)**

b. For the JFET amplifier shown in Fig.Q9(b). Calculate i) g_m ii) r_d iii) Z_i iv) Z_0 v) A_V. **(08 Marks)**

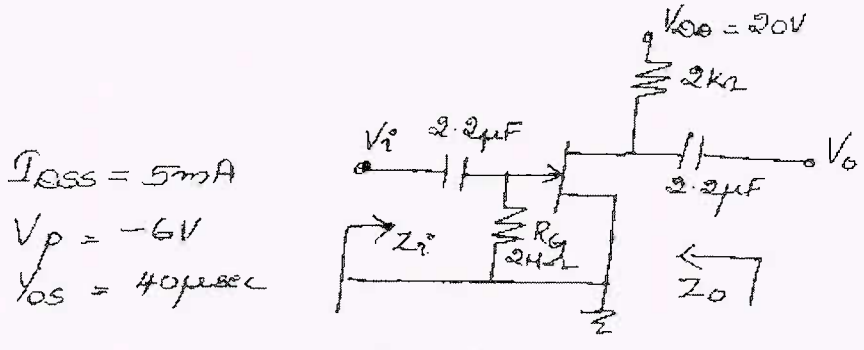

Fig.Q9(b)

OR

10 a. With the help of neat diagram, explain the construction, working and characteristics of n-channel JFET. **(08 Marks)**

b. Define transconductance and r_d of FET. Explain the procedure to determine the above values graphically. **(08 Marks)**

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CBCS SCHEME

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15EE35

Third Semester B.E. Degree Examination, June/July 2019
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. Prove the following using Boolean theorems : **(04 Marks)**
i) $(x + \bar{x}\,\bar{y})(\bar{x} + \bar{y}) + yz = \bar{y} + z$ ii) $\bar{w}\,\bar{y}\,\bar{z} + wz + \bar{y}z + xyz = \bar{w}\,\bar{y} + wz + xz$.

b. Using K – maps determine all the minimal sums and products of the following Boolean function.
i) $f(w, x, y, z) = \pi\, m(1, 3, 4, 5, 10, 11, 12, 14)$
ii) $g(a, b, c, d) = \Sigma\, m(0, 1, 4, 8, 9, 10) + dc(2, 11)$. **(07 Marks)**

c. Using MEV method determine minimal sum for the following function where x, y, z are map variables. Realize the expression using double rail logic. **(05 Marks)**
$f(A, B, x, y, z) = A\,\bar{x}\,\bar{y}\,\bar{z} + A\,\bar{x}\,\bar{y}z + A\,x\,\bar{y}\,z + B\,\bar{x}\,\bar{y}z + B\bar{x}\,y\,\bar{z} + \bar{x}\,y\,z + x\,\bar{y}\,\bar{z}$.

OR

2 a. For the following Boolean function use Quine Mc Cluskey algorithm method and Petrick's method to obtain all the irredudant disjunctive normal expressions. Which of these from minimal sums? $f(a, b, c, d) = \Sigma\, m(0, 4, 7, 8, 11, 12, 14, 15)$. **(08 Marks)**

b. For the following function use decimal Quine Mc Cluskey method and prime implicant table reduction technique to obtain minimal sum.
$f(a, b, c, d) = \Sigma\, m(0, 1, 2, 4, 6, 7, 9, 11, 12, 13, 15)$. **(08 Marks)**

Module-2

3 a. Implement the following functions using IC 74139 , a – 2 to 4 decoder.
i) $f_1(abc) = \Sigma(3, 5, 6, 7)$ ii) $f_2(a, b, c) = \Sigma(1, 2, 4)$ **(04 Marks)**

b. Design a 4 to 2 line priority encoder with 'valid' output where highest priority is given to input with highest index and obtain the minimal sum expressions for outputs. Realize the expressions with basic gates. **(06 Marks)**

c. Design and implement half adder and half subtractor circuits, with a and b as inputs. **(06 Marks)**

OR

4 a. Implement $f(a, b, c) = \Sigma\, m(1, 4, 5, 6, 7)$ using
i) 4 – 1 MUX with 'b' and 'c' to select line ii) ii) 2 – 1 MUX with 'a' to select line
Show with K – maps and logic circuits. **(08 Marks)**

b. The 1-bit comparator had 3 outputs corresponding to $a > b$, $a = b$ and $a < b$. It is possible to code these three outputs using two bits pq such that $pq = 10$ for $a > b$, $pq = 00$ for $a = b$ and $pq = 01$ for $a < b$. This reduces the number of output lines of each 1-bit comparator to 2. The 1-bit comparator at the most significant position, however, should have a converter to convert back to three outputs. Design such a 1-bit comparator as well as the output converter network. **(08 Marks)**

Module-3

5 a. Design a switch debouncer using SR latch. Show relevant logic diagram and timing diagrams. **(06 Marks)**

b. What are characteristic equations? Derive them for SR, JK and T flip-flops. **(06 Marks)**

c. Clearly distinguish between:
i) Synchronous and asynchronous circuits
ii) Combinational and sequential circuits. **(04 Marks)**

OR

6 a. Explain with suitable logic and timing diagram:
i) Serial-in-serial out shift register
ii) Parallel-in-parallel out unidirectional shift register. **(08 Marks)**

b. Consider the synchronous counter shown in Fig.Q.6(b). Assuming it is initialized to "000" prior to the first count pulse, determine the counting sequence. Is this counter self correcting. **(08 Marks)**

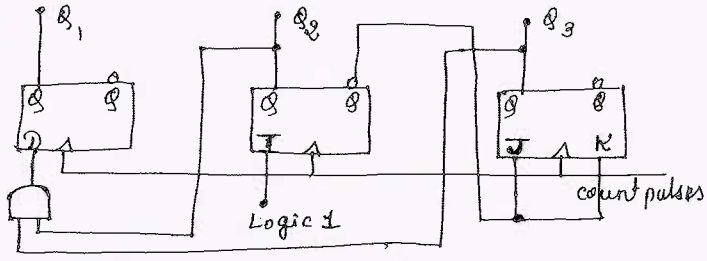

Fig.Q6(b)

Module-4

7 a. Briefly explain structure of clocked synchronous sequential network. **(05 Marks)**

b. Compare Mealy and Moore models. **(05 Marks)**

c. Construct the state table for the following state diagram in Fig.Q7(c). **(06 Marks)**

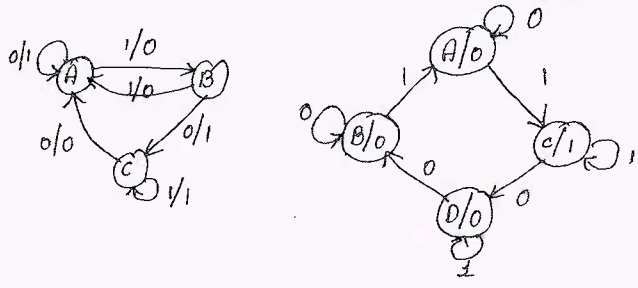

Fig.Q7(c)

OR

8 a. Design a clocked sequential circuit that operates according to state diagram shown in Fig.Q8(a). Implement the circuit using D-flip-flops. **(08 Marks)**

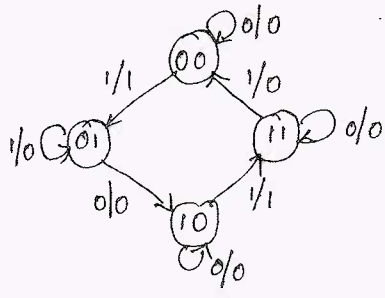

Fig.Q8(a)

b. For the clocked synchronous sequential network shown in Fig.Q8(b). Construct excitation table, transition table, state table and state diagram. **(08 Marks)**

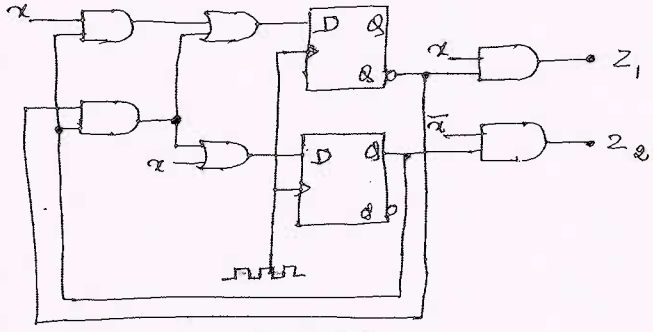

Fig.Q8(b)

Module-5

9 a. With schematic explain VHDL logical and relational operators. **(08 Marks)**

b. Briefly explain all VHDL data types. **(08 Marks)**

OR

10 a. Compare VHDL and verilog in detail. **(08 Marks)**

b. Write data flow description of a half adder (in both VHDL and verilog). Draw the truth table and derive the Boolean expressions, simulate and verify the circuit. **(08 Marks)**

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CBCS SCHEME

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15EE36

Third Semester B.E. Degree Examination, June/July 2019
Electrical and Electronic Measurements

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive the dimension of MMF, EMF, magnetising force and flux density in LMTI system. **(04 Marks)**

b. In deriving equation for resistance in Hay's bridge the following expression is obtained

$$R = \frac{w^2 R_1 R_2 R_3 C^2}{1 + w^2 R_2^2 C}$$

Find whether the equation is dimensionally correct or not. In case there is an error, find the error and correct the question accordingly. **(08 Marks)**

c. State and explain sensitivity of Wheatstone's bridge. **(04 Marks)**

OR

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

b. The bridge consists of the following :
Arm AB – a choke coil having a resistance R_1 and inductance L_1.
Arm BC – a non inductive resistance R_3
Arm CD – a mica – condenser C_4 is series with a non inductive resistance R_4.
Arm DA – non inductive resistance R_2.
When the bridge is fed from a source of 500Hz. balance is obtained under following conditions $R_2 = 2410\Omega$, $R_3 = 750\Omega$, $C_4 = 0.35\ \mu F$, $R_4 = 64.5\Omega$. The series resistance of capacitor is 0.4Ω. Calculate the resistance and inductance of the choke coil. The supply is connected between A and C while the detector is between B and D. **(08 Marks)**

Module-2

3 a. Derive the torque equation of single phase electrodynometer type wattmeter. **(06 Marks)**

b. A 3-ϕ 400V motor takes an input of 40kW at 0.45 p.f lag. Find readings of each of the two single phase wattmeter connected to measures the input. **(05 Marks)**

c. The name plate of a single phase energy meter reads as 250V, 20A, 1800 rev/kwh. The meter is tested at $\frac{3}{4}^{th}$ load and upf. The meter makes 20 revolutions in 10sec. Determine the percentage error in the reading of the energymeter. **(05 Marks)**

OR

4 a. The constant of energy meter is 750rev/kwh calculate the number of revolutions made by it when connected to a load carrying 100A at 230V and 0.8p.f in 30sec. If it makes 110 revolutions in 30sec. find the percentage error. **(06 Marks)**

b. Derive an expression for a single phase induction type energy meter to show that the number of revolutions of disc are proportional to the power consumed by the load. **(06 Marks)**

c. What are the causes of creeping and how it is prevented. **(04 Marks)**

Module-3

5 a. What is shunt? How it is used to extend the range of an ammeter. (04 Marks)

b. A current transformer has bar primary and 400 secondary turns. The secondary winding has an impedance $(0.3 + j0.4)\Omega$ and the secondary burden is an ammeter of impedance $(1.5 + j0.6)\Omega$. The core requires 80 A magnetization and 60A for core loss.
Find :
i) The ratio error when ammeter reads 5A and the primary current
ii) The turns compensation required to bring the ratio error to zero
iii) Phase angle of the current transformer (08 Marks)

c. Differentiate between current transformer and potential transformer. (04 Marks)

OR

6 a. Explain Hopkinson's permeameter. (06 Marks)

b. Explain the constructional details of flexmeter. (06 Marks)

c. Explain the measurement of leakage factor using search coil. (04 Marks)

Module-4

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

b. With a block diagram, explain the working of a true RMS responding voltmeter. (06 Marks)

c. Mention the salient features of digital voltmeter. (06 Marks)

OR

8 a. Explain the operation of successive approximation type of digital voltmeter. (06 Marks)

b. With a neat block diagram, explain the principle of working of electronic energy meter. (06 Marks)

c. What is the working principle of Q meter? (04 Marks)

Module-5

9 a. With the help of neat diagram. Explain EMG Recording. (06 Marks)

b. Explain the methods of magnetic tape recording in brief. (10 Marks)

OR

10 a. With a neat figure, explain the liquid crystal display. (06 Marks)

b. Draw and explain the structure and main components of conventional Cathode Ray Tube. (10 Marks)

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CBCS SCHEME

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17EE42

Fourth Semester B.E. Degree Examination, June/July 2019
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. Discuss the utility of hydrograph, flow duration curve and mass curve for the power plants. **(06 Marks)**

b. Explain with neat sketch the working of hydroelectric power plant station and explain the function of each component in it. **(10 Marks)**

c. Describe different turbines and their use in hydroelectric plants. **(04 Marks)**

OR

2 a. What are the main considerations for selection of site for a hydroelectric power station? **(06 Marks)**

b. Explain the governing mechanism of water turbine, with neat sketch. **(06 Marks)**

c. How the Hydro plants are classified? Explain in detail. **(08 Marks)**

Module-2

3 a. A thermal station has an overall efficiency of 21% and 0.75 kg of coal is burnt per kWh of generated energy. Determine the calorific value of coal. **(04 Marks)**

b. Draw the schematic diagram of modern steam power station and explain its operation with its important components. **(10 Marks)**

c. Write short notes on :
(i) Electrostatic precipitator
(ii) Underfeed stokers. **(06 Marks)**

OR

4 a. Discuss in brief the methods of improving thermal efficiency of gas turbine power plants. **(09 Marks)**

b. Discuss the advantages and disadvantages of a diesel power plant. **(04 Marks)**

c. Draw a layout of Diesel power plant. Showing the various systems, including cooling, lubrication, starting, intake and exhaust systems. **(07 Marks)**

Module-3

5 a. Explain with a neat diagram various parts of a nuclear reactor, explain clearly the each part. **(06 Marks)**

b. Mention the factors to be considered for the selection of site for nuclear power plant. **(06 Marks)**

c. Describe construction and working of a pressurized water reactor. **(08 Marks)**

OR

6 a. With examples, explain the difference between a fissible material and a fertile material. **(04 Marks)**

b. Describe the different types of fuels used in a Nuclear power plant and discuss the problem of nuclear waste disposal. **(08 Marks)**

c. Explain the function of moderator, coolant, control rod and shielding in nuclear power plant. **(08 Marks)**

Module-4

7 a. Explain the function of transformer, high voltage circuit breaker and high voltage insulator in substation. **(06 Marks)**

b. Define substation and mention different types of substation. **(06 Marks)**

c. Explain resonant grounding and resistance grounding with a neat diagram. **(08 Marks)**

OR

8 a. Explain single bus-bar with bus sectionalizer. **(06 Marks)**

b. Explain Gas Insulated substation and mention its advantages. **(08 Marks)**

c. Explain Earthing Transformer with neat diagram. **(06 Marks)**

Module-5

9 a. Define Tariff. Explain (i) Block Rate Tariff (ii) Two Port Tariff (iii) KVA Maximum demand Tariff. **(06 Marks)**

b. Explain methods of determination of depreciation. **(09 Marks)**

c. Write a short notes on Classification of costs. **(05 Marks)**

OR

10 a. State the causes and effects of a poor power factor. Also explain methods of power factor improvement. **(10 Marks)**

b. Calculate the annual energy cost of an industrial consumer who takes a load of 20 kW for 1 hour per day, 150 kW for 7 hours per day and 50 kW for 8 hours/day. The tariff in force is Rs. 20 per kilowatt of maximum demand (Maximum demand = 220 kW) and 10 paise per KWH. Assume 6 working days in a week. **(06 Marks)**

c. Explain concept of load sharing and choice of size and number of generating plants. **(04 Marks)**

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CBCS SCHEME

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17EE45

Fourth Semester B.E. Degree Examination, June/July 2019
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. Obtain the relationship between rectangular and cylindrical co-ordinate system. **(06 Marks)**

b. Find dot product, cross product and unit vector of $\overline{A}$ for the following vectors :
$\overline{A} = 3\overline{ax} + 4\overline{ay} - 5\overline{az}$
$\overline{B} = -6\overline{ax} + 2\overline{ay} + 4\overline{az}$ **(08 Marks)**

c. State and explain Coulomb's law in vector form. **(06 Marks)**

OR

2 a. Give the Cartesian coordinates of the vector field $\overline{H} = 20\overline{a\rho} - 10\overline{aQ} + 3\overline{az}$ at the point P(x=5, y=2, z=-1). **(08 Marks)**

b. State the prove Gauss divergence theorem. **(06 Marks)**

c. If $\overline{D} = (2y^2z - 8xy)\overline{ax} + (4xyz - 4x^2)\overline{ay} + (2xy^2 - 4z)\overline{az}$. Determine div of D at P(1, -2, 3). **(06 Marks)**

Module-2

3 a. Prove that electric-field intensity is expressed as negative gradient of scalar potential. **(07 Marks)**

b. Derive current continuity equation with usual notation. **(06 Marks)**

c. Obtain the boundary conditions between Dielectric and Conductors. **(07 Marks)**

OR

4 a. Given $V = 2x^2y - 5z$ at point P(-4, 3, 6) find potential, electrified intensity and volume charge density. **(05 Marks)**

b. Derive the expression for capacitor of a parallel plate capacitor containing 2 dielectrics . **(07 Marks)**

c. Obtain the expression for energy density in free space for electrostatic field. **(08 Marks)**

Module-3

5 a. Derive Laplace equation and Poisson's equation from point form of gauss law in all the three co-ordinate system. **(06 Marks)**

b. Prove the uniqueness of solution using uniqueness theorem. **(08 Marks)**

c. State and explain Biot-Savart's law and Ampere's circuit law. **(06 Marks)**

OR

6 a. Verify the potential field given satisfies the Laplace's equation $V = 2x^2 - 3y^2 + z^2$. **(05 Marks)**

b. Obtain the equation for curl$(\nabla \times \bar{H}) = \bar{J}$ by considering differential surface element and equations. **(08 Marks)**

c. If a field given $\bar{F} = (x + 2y + az)\bar{ax} + (bx - 3y - z)\bar{ay} + (4x + cy + 2z)\bar{az}$, find the constants a, b, c such that the field is irrotational. **(07 Marks)**

Module-4

7 a. State and explain Lorentz force equation. **(05 Marks)**

b. A point charge Q = 18nc has a velocity of 5×10^6m/s in the direction $\bar{au} = 0.6\bar{ax} + 0.75\bar{ay} + 0.3\bar{az}$. Calculate the magnitude of the force exacted on the charge by the field :

i) $\bar{E} = -3\bar{ax} + 4\bar{ay} + 6\bar{az}$ KV / m

ii) $\bar{B} = -3\bar{ax} + 4\bar{ay} + 6\bar{az}$ mT

iii) $\bar{B}$ and $\bar{E}$ together acting. **(08 Marks)**

c. Derive the boundary conditions at the interface between two magnetic materials of different permeabilites. **(07 Marks)**

OR

8 a. Derive the equation for magnetic force between two differential current elements. **(07 Marks)**

b. Derive the expression for the inductance of a solenoid and torroid. **(07 Marks)**

c. Consider an air core torroid with 500 turns cross sectional area of $6cm^2$ and mean radius of 15cm and carries current of 4amps. Find reluctance, $\bar{B}, \bar{H}$. **(06 Marks)**

Module-5

9 a. State and explain Faraday's law. **(05 Marks)**

b. List Maxwell's equations for time varying fields in integral form and point form. **(08 Marks)**

c. Explain skin depth and skin effect. Derive the expression for skin depth. **(07 Marks)**

OR

10 a. State and explain Pointing theorem with derivation $\bar{P} = \bar{E} \times \bar{H}$. **(07 Marks)**

b. Derive expression for displacement current density for time varying fields. **(07 Marks)**

c. A 300MHz uniform plane wave propagates through fresh water for which $\sigma = 0$, $\mu_r = 1$, $\epsilon_r = 78$. Calculate attenuation constant, phase constant, wavelength intrinsic impedance $(\alpha, \beta, \lambda, \eta)$. **(06 Marks)**

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CBCS SCHEME

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17EE46

Fourth Semester B.E. Degree Examination, June/July 2019
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. Define and explain the following terms:
i) Input bias current
ii) Input offset current
iii) CMRR. **(06 Marks)**

b. With a neat circuit diagrams, explain working and design procedure of capacitor coupled voltage follower. **(08 Marks)**

c. For the circuit shown in Fig.Q.1(c), find V_0 given $R_F = 50K\Omega$ and $R_1 = 10K\Omega$ **(06 Marks)**

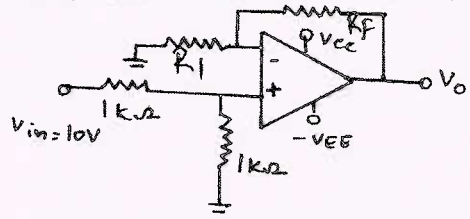

Fig.Q.1(c)

OR

2 a. 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. **(12 Marks)**

b. Explain with a neat circuit, scaling and averaging amplifier using op-amp in inverting configuration. **(08 Marks)**

Module-2

3 a. Explain the following terms with respect to voltage regulator: i) Line regulation ii) Load regulation iii) Ripple rejection. **(06 Marks)**

b. With a neat circuit diagram, explain working of I order high pass filter and draw its typical frequency response curve. **(10 Marks)**

c. A first order low pass filter has cut off frequency of 1kHz the resistance value designed is 15.6KΩ. Calculate the new value of resistance. If the cut off frequency is to be changed to 1.6kHz. Assume capacitor value as constant. **(04 Marks)**

OR

4 a. Explain working and design of voltage follower regulator. **(07 Marks)**

b. An LM 317 voltage regulator is required to provide 6V output from 15V supply. Load current is 200mA. Design the circuit. Assume $I_1 = 1mA$ $V_{ref} = 1.25V$. **(06 Marks)**

c. Design a wide band pass filter with $f_L = 200Hz$, $f_H = 1kHz$ and pass band gain = 4. Assume capacitor values of high pass and low pass sections as 0.05μF and 0.01μF respectively. Also calculate Q-factor, band width and center frequency. **(07 Marks)**

Module-3

5 a. Explain the working of an inverting voltage comparator circuit. Draw the input, output waveforms when 'V_{ref}' is positive and negative. **(06 Marks)**

b. A triangular/rectangular waveform generator uses μA741 opamp with ±15V supply. Design a suitable circuit to obtain triangular output of $5V_{p-p}$, frequency variation from 200Hz to 2kHz and duty cycle adjustment from 20% to 80% of total time period. **(08 Marks)**

c. With a neat circuit diagram, explain working and design procedure of RC phase shift oscillator. **(06 Marks)**

OR

6 a. With a neat circuit diagram, explain non inverting Schmitt trigger, if UTP is to be made OV. explain the modification to be done in circuit, draw the relevant input/output waveforms. **(10 Marks)**

b. Explain the working of voltage to current converter with grounded load. **(04 Marks)**

c. With a neat circuit diagram, explain Sawtooth ware oscillator. **(06 Marks)**

Module-4

7 a. With a neat circuit diagram, explain working of a non saturation precision half wave rectifier and draw its input and output waveforms. **(08 Marks)**

b. Explain the working principle of linear RAMP analog to digital converter. **(06 Marks)**

c. Design a precision full wave rectifier to produce 2V peak output from sine wave input of peak value 0.5V and frequency of 1MHz, use 741 opamp with ±12V supply. **(06 Marks)**

OR

8 a. Explain R-2R ladder digital to analog converter circuit. **(10 Marks)**

b. Digital input for a 4-bit DAC is 0110. Calculate its analog equivalent output voltage. **(04 Marks)**

c. Explain working ADC using successive approximation method. **(06 Marks)**

Module-5

9 a. With a neat diagram, explain the internal architecture of IC555 timer. **(10 Marks)**

b. Explain the operating principle of phase locked loop. **(06 Marks)**

c. Define the terms related to PLL
   i) Lock range
   ii) Capture range
   iii) Pull in time
   iv) Tracking range. **(04 Marks)**

OR

10 a. Explain how XOR gates can be used as phase detector in PLL. **(06 Marks)**

b. Explain monostable multivibrator, realized using IC555 timer. **(07 Marks)**

c. A PLL system with 105 kHz input has VCO with 100kHz free running frequency and sensitivity of 3.3 kHz/V. Phase detector has sensitivity of 0.68V/rad and amplifier gain of 5. Calculate : i) Loop gain ii) Phase difference iii) Static error voltage iv) Tracking range. **(07 Marks)**

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15EE43

Fourth Semester B.E. Degree Examination, June/July 2019
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. Define sag. What are factors affecting sag? **(04 Marks)**

b. Discuss any two methods to improving the string efficiency in string insulator. **(06 Marks)**

c. An overhead line over a hillside with a gradient of 1 in 15 is supported by two 40 m towers. The horizontal distance between towers is 300 m. The weight of the conductor 1.5 kg/m and the tension is 1500 kg. Find the clearance between the lowest point of the conductor and the ground. **(06 Marks)**

OR

2 a. Discuss the properties of transmission line conductors. **(04 Marks)**

b. Obtain the expression for sag in overhead line conductor supported at different levels of height. **(06 Marks)**

c. A 3-phase overhead transmission line is being supported by three disc insulator. The potentials across top and middle units are 9 KV and 11 KV respectively. Calculate:
i) The ratio of capacitance between pin and earth to self capacitance of each unit
ii) The line voltage
iii) String efficiency **(06 Marks)**

Module-2

3 a. Explain the terms self GMD and mutual GMD. **(04 Marks)**

b. The three conductors of 3-phase line are arranged at the three corners of a triangle of sides 2m, 2.5m and 4.5m. Calculate the inductance per km of the line when conductors are regularly transposed. The diameter of each line conductors are 1.24 cm. **(06 Marks)**

c. Derive the expression for inductance of a single phase line. **(06 Marks)**

OR

4 a. Write a short note on transposition of transmission lines. **(04 Marks)**

b. A single phase overhead line 30 km long consists of two parallel wires each 5 mm in diameter and 1.5 m apart. If the line voltage be 50 KV at 50 Hz. Calculate current with the line open circuited. **(06 Marks)**

c. Derive the expression for a capacitance of the symmetrical 3-phase line. **(06 Marks)**

Module-3

5 a. Write a short note on classification of overhead transmission lines. **(04 Marks)**

b. Determine ABCD constants of medium line nominal T-method and check AD-BC = 1. **(06 Marks)**

c. A 220 KV, 3-phase overhead transmission line has an impedance per phase of $(20 + J100)\Omega$ and admittance of J0.0010 mho. Using π-model, determine the sending voltage and current when the current at the receiving end is 300 A at 0.9 pf lagging. **(06 Marks)**

OR

6 a. Discuss Ferranti effect in transmission lines. **(04 Marks)**

b. A 3 phase 300 km long transmission line has
Inductance/Ph = 10^{-3} H/km
Capacitance/Ph = 10×10^{-9} F/km
Resistance/Ph = 0.02 Ω/km
Determine ABCD parameters of the line. **(06 Marks)**

c. A single phase transmission line supplier of a load 1 MW at 11 KV, 0.8 pf lagging. The resistance and reactances of the line are 5Ω and 10Ω respectively. Determine:
i) Sending end voltage
ii) Efficiency of transmission line
iii) Percentage of regulation **(06 Marks)**

Module-4

7 a. Discuss the advantages and disadvantages of Corona. **(04 Marks)**

b. Prove that for a 3 layer inter sheath

$$\frac{g_{max}\,(\text{with inter sheath})}{g'_{max}\,(\text{without inter sheath})} = \frac{3}{1+\alpha+\alpha^2} \text{ where } \alpha = \frac{r_1}{r} = \frac{r_2}{r_1} = \frac{R}{r_2}.$$ **(08 Marks)**

c. A single core cable has a diameter of 1.5 cm covered with an insulation layer of 2 cm thickness. The specific resistance of insulation of the material is 7.5×10^{12} MΩ-m. Calculate the insulation resistance/km of the cable. **(04 Marks)**

OR

8 a. Draw the cross sectional view of single core cable and explain its construction. **(04 Marks)**

b. A 132 KV line with 1.956 cm diameter conductor is built so, that corona takes place if the line voltage exceeds 210 KV (rms). If the value of potential gradient at which insulation occurs can be taken as 30 KV/cm. Find the spacing between conductors. Assume δ = 1, irregularity factor = 1. **(06 Marks)**

c. For most economical diameter of single cone cable to be used on a 132 KV, 3-phase system. Find also the overall diameter of the insulation if the peak permissible stress is not be exceed 60 KV/cm. **(06 Marks)**

Module-5

9 a. What are requirements of a power distribution system? **(04 Marks)**

b. Discuss the effect of disconnection of neutral in a 3-phase Four wire system. **(04 Marks)**

c. A single phase distributor AB is 500 m long and is fed at point A and it is loaded as follows:
i) 100 A at 0.8 pf lagging 200 m from A
ii) 150 A at 0.707 pf lagging at 500 m from A.
The total resistance and reactance of the distributor are 0.2 Ω and 0.1Ω per km respectively. If the receiving end voltage is 400 V, find the sending end voltage and power factor. **(08 Marks)**

OR

10 a. Discuss the limitation of distribution system. **(04 Marks)**

b. Write short note on radial and ring main distribution system. **(06 Marks)**

c. Explain the following with respect to distribution system:
i) Reliability
ii) Quality **(06 Marks)**

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15EE44

Fourth Semester B.E. Degree Examination, June/July 2019
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. What do you mean by back emf in dc motors? Explain the significance of back emf. Also derive the condition for maximum power in dc motors. **(10 Marks)**

b. A 230 V series motor is taking 50 A. Resistance of armature and series field winding is 0.2 Ω and 0.1 Ω respectively. Calculate:
i) Brush voltage
ii) Back emf
iii) Power wasted in armature and mechanical power developed **(06 Marks)**

OR

2 a. Define torque. Derive the expression for torque developed by DC motor from fundamentals. **(10 Marks)**

b. A DC motor drives a 100 KW generator having an efficiency of 87%.
i) What should be the KW rating of the motor?
ii) If the overall efficiency of the motor generator set is 74%, what is the efficiency of the motor?
iii) Also calculate the losses in each machine. **(06 Marks)**

Module-2

3 a. With a neat circuit diagram, explain how Hopkinson's test is performed on dc shunt machines. Mention the merits and demerits of this test. **(10 Marks)**

b. The Hopkinson test on two shunt machines gave the following results for full load.
Line voltage 250 V
Line current excluding field currents 50A
Motor armature current 380A
Field currents 5A and 4.2A.
Calculate the efficiency of each machine. Armature resistance of each machine is 0.02 Ω **(06 Marks)**

OR

4 a. Describe Swinburne's test with the help of neat diagram to find out the efficiency of a dc machine. What are the main advantages and disadvantages of this test? **(10 Marks)**

b. A 220V dc shunt motor at no load takes a current of 3A. The resistance of the armature and shunt field are 0.9 Ω and 250 Ω respectively. Estimate the efficiency of the motor when input current is 18 a. **(06 Marks)**

Module-3

5 a. Draw the phasor diagram of 3ϕ induction motor on no load and load condition and explain. **(06 Marks)**

b. The following test results refer to a 3ϕ 20HP 440V delta connected, 50Hz 4 pole induction motor.
Running light tests : 440V, 10A (line) 1.5 KW input
Locked rotor test: 120V, 30A (line) 2.25 KW input
Draw the circle diagram of this induction motor and determine from the circle diagram full load current and power factor. **(10 Marks)**

OR

6 a. Develop the equivalent circuit of a double cage induction motor and obtain the approximate equivalent circuit. **(06 Marks)**

b. The standstill impedance of the outer cage of a double cage induction motor is $(0.3 + j0.4)\Omega$ and that of the inner cage is $(0.1 + j1.5)\Omega$. Compare the relative currents of the two cages (i) at standstill (ii) at a slip of 5%. Neglect stator impedance. **(10 Marks)**

Module-4

7 a. With a neat diagram, explain star delta starter used for starting 3ϕ induction motor. **(06 Marks)**

b. Explain briefly the different methods of speed control of 3ϕ induction motor. **(10 Marks)**

OR

8 a. Explain double revolving field theory with reference to single phase induction motor. **(06 Marks)**

b. Explain the construction and working of shaded pole motor. **(10 Marks)**

Module-5

9 a. With a neat diagram explain the principle of operation of a 3ϕ synchronous motor. **(06 Marks)**

b. Explain the operation of a synchronous motor under (i) constant load, varying excitation (ii) constant excitation, varying load. Discuss how a synchronous motor can function as synchronous condenser. **(10 Marks)**

OR

10 a. What is a two phase servo motor? Describe its construction and working. Draw its torque speed characteristics for various control voltages. **(10 Marks)**

b. Explain the principle of operations of a linear induction motor. Draw its characteristics. State its important applications. **(06 Marks)**

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CBCS SCHEME

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Fourth Semester B.E. Degree Examination, June/July 2019
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. Define operator Del, ∇. Explain its operation with solar and vector fields. Define divergence, gradient and curl and expression the same in rectangular coordinate system. **(06 Marks)**

b. Evaluate both sides of the Divergence theorem for the field $\bar{D} = 2xy\,\bar{a}_x + x^2\bar{a}_y\ c/m^2$, the surface is a rectangular parallelepiped formed by planes x = 0 and x = 1, y = 0 and y = 2 and z = 0 and z = 3. **(10 Marks)**

OR

2 a. With empherical formula to support, state the following:
i) Gauss law ii) Gauss Divergence theorem iii) Coulomb's law. **(06 Marks)**

b. Determine electric flux density D in Cartesian coordinates caused by P(6, 8, -10) by
i) A point charge of 30 MC at origin.
ii) An infinite line charge with $\rho_L = 40\ \mu c/m$ on x = 0 ; y = 0
iii) A surface charge with $\rho_S = 57.2\ \mu c/m^2$ on this plane z = 9m. **(10 Marks)**

Module-2

3 a. Derive the boundary conditions on E and D at the interface of perfect dielectrics. **(05 Marks)**

b. Determine work done in carrying a charge of -2C from (2, 1, -1) to (8, 2, -1) in an electric field $\bar{E} = y\bar{a}_x + x\bar{a}_y$ v/m along this path $x = 2y^2$. **(07 Marks)**

c. Explain the following terms with empherical formula to support:
i) Current density ii) Potential difference iii) The dipole. **(04 Marks)**

OR

4 a. Derive an expression for the equation of continuity. **(06 Marks)**

b. Obtain an expression for this capacitance per unit length of a co-axial cable with inner conductor radius 'a' meters and outer conductor radius 'b' meters. **(06 Marks)**

c. Determine the capacitance consisting of two parallel metal plates 30cm × 30cm, surface area, separated by 5mm in air. What is the total energy stored by this capacitor of the capacitor is charged to a potential difference of 500V? **(04 Marks)**

Module-3

5 a. State the following terms with empherical formula/expressions to support
i) Biot-Savart's law
ii) Ampere's circuital law and
iii) Stokes theorem. **(05 Marks)**

b. Clearly distinguish between scalar magnetic potential and vector magnetic potential. **(04 Marks)**

c. Given $V = |Ar^4 + Br^{-4}| \sin 4\phi$. Show that $\nabla^2 V = 0$. Select A and B so that V = 100V and (E) = 500 v/m at p(r = 1, ϕ = 22.5 and z = 2). **(07 Marks)**

OR

6 a. Derive Poisson's and Laplace's equation. **(04 Marks)**

b. State and prove uniqueness theorem. **(06 Marks)**

c. Given the field $\bar{H} = 20r^2 \bar{a}_\phi$ A/m. Determine: i) the current density, $\bar{J}$ and ii) Also the total current that crosses the surface r = 1m, $0 < \phi < 2\pi$ and z = 0 (in cylindrical coordinates) **(06 Marks)**

Module-4

7 a. A point charge Q = 18nc moves with a velocity of $5 * 10^6$ m/sec in the direction of $0.06\bar{a}_x + 0.75\bar{a}_y + 0.3\bar{a}_z$ $(\bar{a}_v)$. Calculate the magnitude of the force exerted on the charge by the field

i) $\bar{E} = -3\bar{a}_x + 4\bar{a}_y + 6\bar{a}_z$ kv/m

ii) $\bar{B} = -3\bar{a}_x + 4\bar{a}_y + 6\bar{a}_z$ MT

iii) $\bar{B}$ and $\bar{E}$ acting together. **(08 Marks)**

b. Discuss the magnetic boundary condition to be applied to B, H and M at the interface between two different magnetic materials. **(05 Marks)**

c. Define the terms with empherical formula to support
i) Magnetization and ii) Permeability. **(03 Marks)**

OR

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

b. A toroid 0.2m in diameter and 10sqcm sectional area of the core is uniformly wound with 250 truss of wire. If the flux density in the core is to be 1wb/m^2 and relative permeability of iron is $\mu_r = 500$, what is the exciting current required to be passed in the winding? Determine also the value of self inductance and the stored energy. **(06 Marks)**

c. Find the force /mtr length between two long parallel wires separated by 10cm in air and carrying a current of 100A is opposite direction. State the nature of force between the wires. **(04 Marks)**

Module-5

9 a. Explain Faraday's laws applied to
i) Stationary path, changing field and
ii) Steady field moving circuit
Derive necessary relationship. **(08 Marks)**

b. State and derive an expression for Poynting's theorem. **(08 Marks)**

OR

10 a. List Maxwell's equations for both:
i) Steady and
ii) Time varying fields in integral and differential form, also mention the relevant laws they demonstrate. **(08 Marks)**

b. Discuss the physical significance of displacement current and justify that for the case of a parallel plate capacitor the displacement current is equivalent to conduction current. Comment on the ratio of magnitudes of conduction current density to displacement current density. **(08 Marks)**

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