CBCS Scheme

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15EE32

Third Semester B.E. Degree Examination, June/July 2018
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. For the circuit shown in Fig.Q.1(a), find i_A, i_B and i_C by mesh analysis. **(05 Marks)**

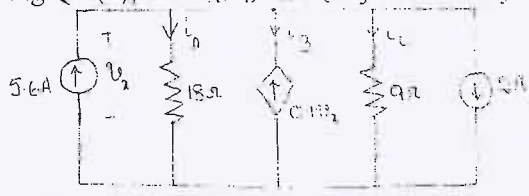

Fig.Q.1(a)

b. Find the equivalent resistance across terminals AB of the network shown in Fig.Q.1(b) using star-delta transformation. Consider all resistance as 10Ω. **(05 Marks)**

Fig.Q.1(b)

c. Compute resonant frequency, half power frequencies, bandwidth and quality factor for a given RLC series circuit with R = 20Ω, L = 50mH and C = 1μF. Also calculate the reactances at resonance. **(06 Marks)**

OR

2 a. Two branches of a parallel circuit have elements R_1 = 6Ω, L = 1mH and R_2 = 4Ω and C = 20 μF. Determine the frequency of resonance when excited with voltage source of variable frequency. **(05 Marks)**

b. Write the equilibrium equations using KVL for the network shown in Fig.Q.2(b). Draw its dual and also write its equilibrium equations. **(05 Marks)**

Fig.Q.2(b)

c. In the network shown in Fig.Q.2(c), solve for all the branch currents using nodal analysis and also show that the sum of power absorbed/delivered by all branches is zero. **(06 Marks)**

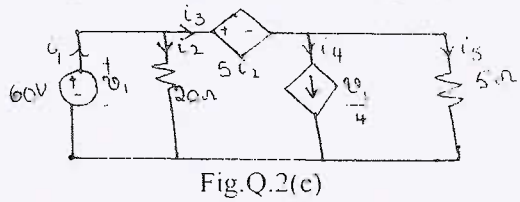

Fig.Q.2(c)

Module-2

3 a. State and prove superposition theorem with an illustration. **(05 Marks)**

b. Obtain the Thevenin equivalent circuit as seen by the load impedance for the network shown in Fig.Q.3(b). **(05 Marks)**

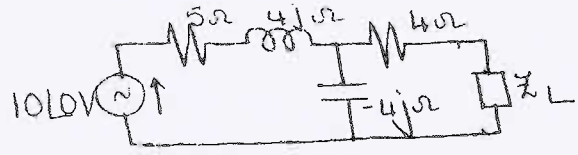

Fig.Q.3(b)

c. State Millman's theorem and apply it to find the current through R_L in the circuit shown in Fig.Q.3(c). **(06 Marks)**

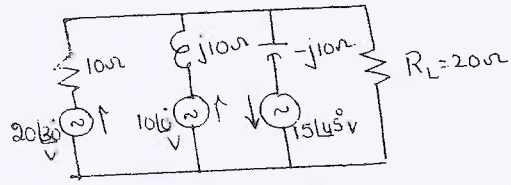

Fig.Q.3(c)

OR

4 a. Prove that maximum power is transferred to the load in an ac circuit when $Z_L = Z_i^*$ where, Z_L = load impedance = $R_L + jx_L$, Z_i = impedance seen at the source $R_i + jx_i$. **(05 Marks)**

b. Determine the Norton equivalent circuit shown in Fig.Q.4(b) as seen by the terminals 'a' and 'b'. **(05 Marks)**

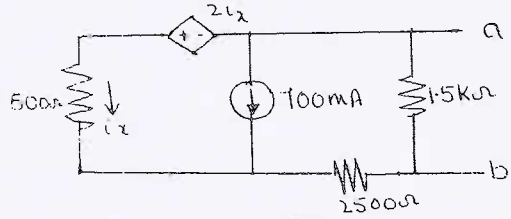

Fig.Q.4(b)

c. In the single source network shown in Fig.Q.4(c), find the current 'I' flowing through the 5Ω branch. Also verify reciprocity theorem for this circuit **(06 Marks)**

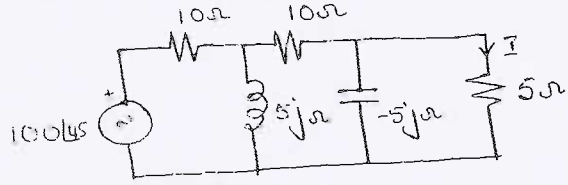

Fig.Q.4(c)

Module-3

5 a. In the network shown in Fig.Q.5(a), switch is changed from position 'a' to 'b' at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0+ if R = 1000Ω, L = 1H, C = 0.1μF and V = 100V. **(05 Marks)**

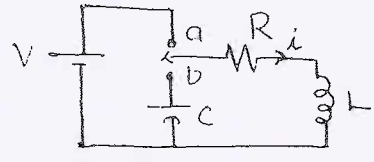

Fig.Q.5(a)

b. In the circuit shown in Fig.Q.5(b), switch is opened at time t = 0. Find the values of V, $\frac{dv}{dt}$, $\frac{d^2v}{dt^2}$ at t = 0+ and v(∞). **(05 Marks)**

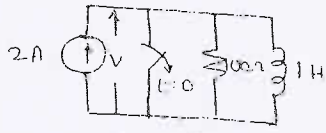

Fig.Q.5(b)

c. Consider a circuit consisting of 1Ω resistance in series with 1F capacitor excited with 5V DC source. Derive an expression for the current flowing in the circuit and draw the current waveform and also calculate the current at 0.1 sec. **(06 Marks)**

OR

6 a. Discuss the behaviour of R, L, C elements at,
i) the time of switching (t = 0+) ii) under steady state (t = ∞). **(06 Marks)**

b. In the circuit shown in Fig.Q.6(b), the switch was in position 'a' and circuit was under steady state. At t = 0, the switch is moved to position b. Find $v_c(t)$ at t equal to i) 0- ii) 0+ iii) ∞ iv) 0.08S. **(10 Marks)**

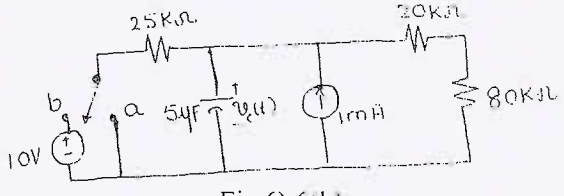

Fig.Q.6(b)

Module-4

7 a. Synthesize the waveform shown in Fig.Q.7(a) and also write the Laplace transform of the synthesized equation. **(05 Marks)**

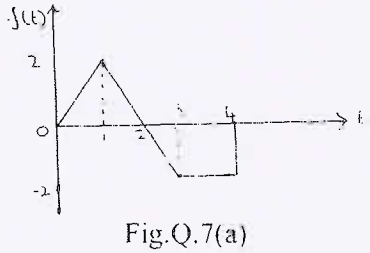

Fig.Q.7(a)

b. State and prove final value theorem as applied in Laplace transform and hence find x(∞) of $x(s) = \frac{5}{s(s+1)(s+2)}$. **(05 Marks)**

c. Determine the voltage $v_c(t)$ for t ≥ 0 for the circuit shown in Fig.Q.7(c) using Laplace transform method. In the circuit, switch is opened at t = 0. **(06 Marks)**

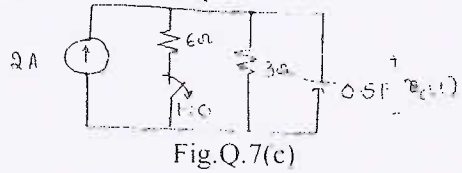

Fig.Q.7(c)

OR

8 a. In the circuit shown in Fig.Q.8(a), the switch is initially in closed position. The switch is opened at t = 0. Determine the expression for current through the resistor using Laplace transform method for $t \geq 0$. **(05 Marks)**

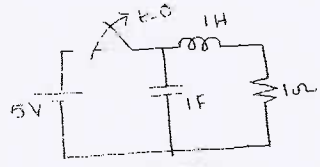

Fig.Q.8(a)

b. Find the Laplace transform of the periodic signal shown in Fig.Q.8(b). **(05 Marks)**

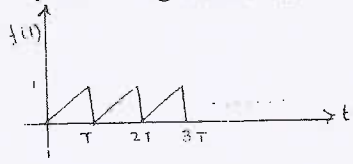

Fig.Q.8(b)

c. Derive an expression for the current flowing through a series RL circuit excited with a DC source of V volts using Laplace transform method. **(06 Marks)**

Module-5

9 a. Derive an expression for 'Displacement voltage of neutral' in a star connected unbalanced load supplied with 3ϕ balanced supply voltages. **(05 Marks)**

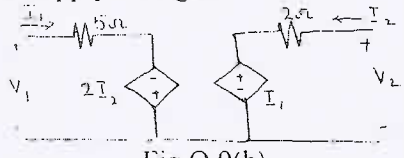

Fig.Q.9(b)

b. Find the Y parameters for the network shown in Fig.Q.9(b). **(05 Marks)**

c. Obtain the driving point impedance function for the network shown in Fig.Q.9(c). Also plot the poles and zeros in the s plane. **(06 Marks)**

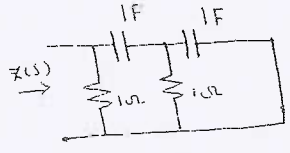

Fig.Q.9(c)

OR

10 a. An unbalanced 3ϕ load is supplied by a symmetrical, 3ϕ, 440V, 3 wire system. The star connected load branch impedances are $Z_R = 5\angle 30\ \Omega$, $Z_Y = 10\angle 45^\circ\ \Omega$ and $Z_B = 10\angle 60^\circ\ \Omega$. Find the line currents. **(09 Marks)**

b. Obtain T parameters for the network shown in Fig.Q.10(b). Using these parameters, find Z parameters. **(07 Marks)**

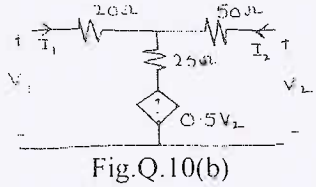

Fig.Q.10(b)

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CBCS Scheme

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15EE33

Third Semester B.E. Degree Examination, June/July 2018
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume Missing data if any.

Module-1

1 a. Draw and explain the full load phasor diagrams of single phase transformer for lagging and leading process factor loads. **(06 Marks)**

b. Find the All day efficiency of single phase transformer having maximum efficiency of 98% at 15 KVA at UPF and loaded as follows :
12 hours – 2KW at 0.5 power factor lagging
6 hours – 2KW at 0.8 power factor lagging
6 hours – no load. **(06 Marks)**

c. Draw the approximate Equivalent circuit of a transformer referred to primary side. **(04 Marks)**

OR

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

b. Explain with the help of connection and phasor diagrams, how scott connections are used to obtain two base supply from three phase supply mains. **(06 Marks)**

c. The following results were obtained on a
50 KVA, 2400/120V, transformer
O.C test : 396W, 9.65A, 120V
S.C test : 810W, 20.8A, 92V
Determine : i) The circuit constants
ii) The efficiency at full load, 0.8 p.f. lagging
iii) The approximate vtg regulation. **(05 Marks)**

Module-2

3 a. Discuss the necessary conditions for the parallel operation of 2 transformers. **(05 Marks)**

b. Drive an expression for the currents shared by between 2 transformers connected in parallel supplying a common load when no load voltages of these transformers are un equal. **(06 Marks)**

c. How stabilization is achieved due to tertiary winding. **(05 Marks)**

OR

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

b. Define auto transformer? Derive an expression for the saving of copper in an Auto transformer. **(06 Marks)**

Module-3

5 a. Discuss the causes of noise in transformers? How to reduce the noise in transformers. **(05 Marks)**

b. Explain current Inrush phenomenon in transformers. **(05 Marks)**

c. With a circuit diagram, explain in detail Sumpner's test for determining the efficiency and voltage regulation of transformer. **(06 Marks)**

OR

6 a. With a neat circuit diagram, explain armature reaction in DC machines. **(06 Marks)**

b. Draw and explain the characteristics of DC shunt generator. **(05 Marks)**

c. Derive EMF Equation of synchronous generator. **(05 Marks)**

Module-4

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

b. Define voltage regulation of an alternators. **(03 Marks)**

c. What is synchronization of alternators? Need for parallel operation of alternators. **(05 Marks**

OR

8 a. With a neat circuit diagram explain the slip test on salient pole synchronous machine to determine X_d and X_q from slip test. **(08 Marks)**

b. Write a note on V-curves of synchronous generator. **(04 Marks)**

c. Define electrical load diagram of a synchronous generator. **(04 Marks)**

Module-5

9 a. What are the various methods of determining the voltage regulation for 3ϕ alternator and explain any one method in detail. **(08 Marks)**

b. The open and short circuit test reading for a 3ϕ - star connected 1000 KVA, 200V, 50Hz synchronous generator are,

Field amps	10	20	25	30	40	50
OC terminal vtg	800	1500	1760	2000	2350	2600
SC armature current in amp	–	200	250	300	–	–

The armature effective resistance is 0.2ohm per phase. Draw the characteristic curves and estimate the full load percentage regulation i) 0.8 p.f lagging ii) 0.8 p.f leading. **(08 Marks)**

OR

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

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

c. Discuss about short circuit ratio and its significance. **(04 Marks)**

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CBCS SCHEME

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Third Semester B.E. Degree Examination, June/July 2018
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. Derive an expression for E_{Th}, I_B and V_{CE} for voltage divider bias circuit using exact analysis. **(08 Marks)**

b. For the emitter bias network of Fig.Q1(b), determine the following parameters:
(i) I_B (ii) I_C (iii) V_{CE} (iv) V_C (v) V_E (vi) V_B (vii) V_{BC} **(08 Marks)**

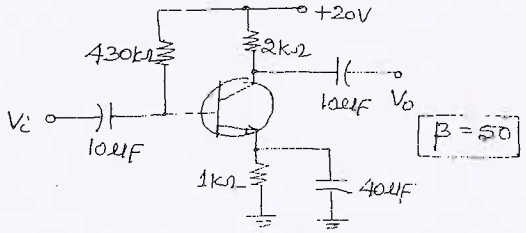

Fig.Q1(b)

OR

2 a. Derive the expression for stability factor for fixed bias circuit with respect to I_{CO}, V_{BE} and β. **(10 Marks)**

b. With a neat circuit diagram explain the operation of self bias circuit. **(06 Marks)**

Module-2

3 a. With the help of r_e equivalent model, derive an equation for input impedance, output impedance and voltage gain for an emitter follower configuration. **(08 Marks)**

b. For the collector feedback configuration having R_f = 180 kΩ, R_C = 2.7 kΩ, C_1 = 10 μF, C_2 = 10 μF, β = 200, $r_0 = \infty\ \Omega$ and V_{CC} = 9 volts, determine the following parameters:
(i) r_e (ii) Z_i (iii) Z_o (iv) A_V **(08 Marks)**

OR

4 a. High frequency response BJT Amplifier has the following parameters:
R_S = 1 kΩ, R_1 = 40 kΩ, R_2 = 10 kΩ, R_E = 2 kΩ, R_C = 4 kΩ, R_L = 2.2 kΩ, C_S = 10 μF, C_C = 1 μF, C_E = 20 μF, β = 100, r_e = 15.76 Ω, R_i = 1.32 kΩ, A_{Vmid}(Amplifier) = –90 , $r_o = \infty\ \Omega$, V_{CC} = 20 V, C_{be} = 36 pF, C_{bc} = 4 pF, C_{ce} = 1 pF, C_{wi} = 6 pF, C_{wo} = 8 pF
(i) Determine f_{Hi} and f_{Ho} (ii) Determine f_β and f_T **(08 Marks)**

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

Module-3

5 a. Derive expressions for Z_i and A_i for a Darlington emitter follower circuit. **(10 Marks)**

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

OR

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

b. Determine the voltage gain, input impedance and output impedance with feedback for voltage series feedback amplifier having $A = -100$, $R_i = 10\ k\Omega$, $R_o = 20\ k\Omega$ for feedback of (i) $\beta = -0.1$ and (ii) $\beta = -0.5$. **(06 Marks)**

c. For a current series feedback amplifier, derive an expression for output impedance with feedback. **(06 Marks)**

Module-4

7 a. With a neat circuit and waveforms, explain the operation of a transformer coupled class-A power amplifier. **(08 Marks)**

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

OR

8 a. With a neat circuit diagram and waveform explain the operation of RC phase shift oscillator using BJT. Write the expression for frequency of oscillation. **(08 Marks)**

b. With a neat circuit diagram and waveform, explain the working principle of crystal oscillator operating in series resonant mode. A crystal has the following parameters: L = 0.334 H, C = 0.065 PF and R = 5.5 kΩ. Calculate the resonant frequency. **(08 Marks)**

Module-5

9 a. Derive the expression for A_v, Z_i and Z_o for a JFET common source amplifier with fixed bias configuration. **(08 Marks)**

b. For a self bias JFET circuit, $V_{DD} = +12V$, $R_D = 2.2\ k\Omega$, $R_G = 1\ m\Omega$, $R_S = 1\ k\Omega$, $I_{DSS} = 8mA$, $V_P = -4$ volts. Determine the following parameters:
(i) V_{GS} (ii) I_D (iii) V_{DS} (iv) V_S (v) V_G (vi) V_D **(08 Marks)**

OR

10 a. Derive expression for V_{GS}, I_D, V_{DS}, V_D and V_S for a voltage divider bias circuit using FET. **(08 Marks)**

b. With neat sketches, explain the basic operation and characteristics of n-channel depletion type MOSFET. **(08 Marks)**

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CBCS SCHEME

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15EE35

Third Semester B.E. Degree Examination, June/July 2018
Digital System Design

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define combinational logic, canonical SOP and canonical POS. with examples. **(06 Marks)**

b. Place the following equations into proper canonical form:

i) $R = f(a,b,c) = (\bar{a} + b)(b + \bar{c})$ into minterm canonical form.

ii) $Z = f(a,b,c) = a + \bar{a}\bar{b}$ into maxterm canonical form. **(04 Marks)**

c. Solve the following Boolean equation using four variable Karnaugh map and implement the simplified equation using minimum number of logic gates.
f(a, b, c, d) = ∑ (0, 5, 7, 8, 10, 13) + d (2, 4, 14, 15). **(06 Marks)**

OR

2 a. Solve four variable expression using Quine McCluskey minimization technique.
$K = f(a,b,c,d) = \pi M(0,3,4,7,8,10,12,14) + d(2,6)$ **(08 Marks)**

b. Simplify the Boolean expression using a 3-variable VEM, with 'Z' as MEV
f (w, x, y, z) = ∑m (3, 4, 5, 7, 8, 11, 12, 13, 15). **(08 Marks)**

Module-2

3 a. Implement 3-bit binary to gray code conversion circuit using IC 74139. Draw neat diagram, truth table with switching equations in SOP form. **(06 Marks)**

b. Implement the following multiple output functions for active low outputs using IC74138.
$F_1 = f(x,y,z) = \bar{x}y + xy\bar{z} + xz$, $F_2 = f(x,y,z) = \pi(0,1,4,5,7)$. **(04 Marks)**

c. What are multiplexers? Implement the function using 8:1 MUX.
f(a, b, c, d) = ∑m(0, 1, 3, 4, 7, 10, 11, 14, 15). **(06 Marks)**

OR

4 a. Implement 4-bit parallel adder/subtractor using 4-full adder blocks. If C_{in} = 0 the circuit should act as adder and if C_{in} = 1 the circuit should act as substractor. Explain its operation by considering examples. **(06 Marks)**

b. What is the problem associated with the parallel adder? Explain the method of correcting it, with suitable circuit and equations. **(06 Marks)**

c. Design 1-bit comparator circuit, represent truth table, K-maps and logic diagram. **(04 Marks)**

Module-3

5 a. Explain the operation of Master-Slave JK flip-flop with logic diagram, truth table, symbol and timing diagram. **(08 Marks)**

b. Distinguish between sequential circuits and combinational circuits. **(04 Marks)**

c. Explain the operation of basic bistable element, using two-inverter configuration. **(04 Marks)**

OR

6 a. Derive characteristics equations for SR flip-flop and JK flip-flop, represent truth table and K-maps. **(04 Marks)**

b. Explain the operation of 4-bit ring counter and twisted ring counter. **(06 Marks)**

c. Design synchronous MOD6 counter using clocked 'D' flip flops for the sequence $0 \rightarrow 2 \rightarrow 3 \rightarrow 6 \rightarrow 5 \rightarrow 1$, again, 0.... represent application table, excitation table and logic diagram. **(06 Marks)**

Module-4

7 a. Define state variables and excitation variables and write a note on Moore and Mealy sequential models. **(08 Marks)**

b. For the logic diagram shown in Fig.Q.7(b), find excitation table, state table and state diagram. **(08 Marks)**

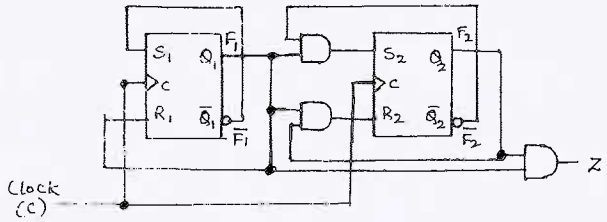

Fig.Q.7(b)

OR

8 a. Analyze the circuit shown in Fig.Q.8(a), obtain excitation table, state table and state diagram. **(10 Marks)**

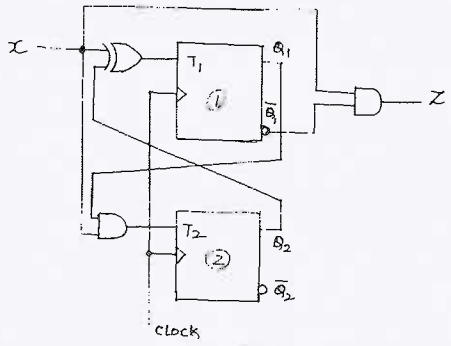

Fig.Q.8(a)

b. Design the sequential logic circuit for single input single output system shown in Fig.Q.8(b) state diagram using clocked 'D' flip-flop. **(06 Marks)**

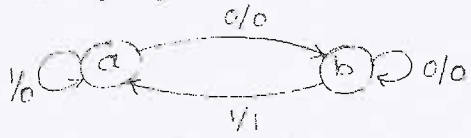

Fig.Q.8(b)

Module-5

9 a. Explain the structure of VHDL and verilog module with example code for each and compare them. **(08 Marks)**

b. List the various styles/types of descriptions in VHDL and verilog. Explain VHDL structural description with example code. **(08 Marks)**

OR

10 a. Explain the structure of data flow description in VHDL and verilog, using suitable example code. **(08 Marks)**

b. Write VHDL and verilog code for 2 × 2 magnitude comparator for all input combinations. **(08 Marks)**

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CBCS SCHEME

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15EE36

Third Semester B.E. Degree Examination, June/July 2018
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. Discuss limitations of Wheatstone Bridge and explain how low resistance is measured by KDB. **(08 Marks)**

b. For an ac bridge evaluate unknown impedance in the arm DC when bridge is balanced at 2khz with following components in each arm.
Arm AB: 10kΩ
Arm BC: 100μF series with 100kΩ
Arm AD: 50kΩ
Detector is connected between B and D. **(08 Marks)**

OR

2 a. Obtain the dimensional equations in SI units for
i) Absolute permeability ii) Absolute permittivity. **(06 Marks)**

b. Discuss how capacitance of the capacitor is measured by Schering bridge. **(10 Marks)**

Module-2

3 a. Reproduce the errors in 1-ϕ kWh meter and explain how energy meter calibrated. **(08 Marks)**

b. A 1-ϕ energy meter operating at normal 1-ϕ voltage has a constant load of 4A passing through it for 6 hrs at 0.8 power factor. If the meter disc makes 2209 revolutions during this period, what is the meter constant in revolutions/kWh? Calculate the power factor of the load if the number of revolutions made by meter are 1472 when operated at normal 1-ϕ AC supply at 5A for 4 hrs. **(08 Marks)**

OR

4 a. Explain the construction and operating principle of Weston frequency meter and 1-ϕ pf meter. **(08 Marks)**

b. Discuss phase sequence indicator. **(03 Marks)**

c. A Wattmeter has current coil and pressure coil resistance of 0.2Ω and 5000Ω respectively. Evaluate the percentage of error in the Wattmeter reading when load takes 20A, at 250V with 0.8 pf lag for two methods of connection of Wattmeter. **(05 Marks)**

Module-3

5 a. Discuss Silsbee's method of testing CT. **(08 Marks)**

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

OR

6 a. Discuss how the iron losses are measured by using Wattmeter. **(07 Marks)**

b. List advantages of instrument transformers. **(02 Marks)**

c. Discuss how leakage flux is measured. **(07 Marks)**

Module-4

7 a. List advantages of electronic meters over the conventional meters. **(03 Marks)**

b. Discuss construction and operation of TRUE RMS reading voltmeter. **(05 Marks)**

c. List characteristics of DVM and explain successive approximation type DVM. **(08 Marks)**

OR

8 a. Explain the principle of operation Q meter and discuss different application of Q-meter. **(08 Marks)**

b. List different types of DVM. Explain with sketch the Ramp type DVM. **(08 Marks)**

Module-5

9 a. Explain why recorders are essential? With sketch explain x-y recorder. **(08 Marks)**

b. Discuss with necessary figure i) ECG ii) EEG. **(08 Marks)**

OR

10 a. Write a short notes on i) LED ii) Nixie tube iii) LCD. **(08 Marks)**

b. With neat sketch explain LVDT recorder. **(05 Marks)**

c. Write a short note on dot matrix display. **(03 Marks)**

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CBCS Scheme

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15EE42

Fourth Semester B.E. Degree Examination, Dec.2017/Jan. 2018
Power Generation and Economics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With a neat schematic diagram explain the working hydro-electric power plant. **(06 Marks)**
b. Explain hydrograph and hydrological cycle. **(06 Marks)**
c. Mention the merits and demerits of hydroelectric power plant. **(04 Marks)**

OR

2 a. What are the types of turbines? With a neat diagram explain the working of reaction turbine. **(06 Marks)**
b. With a neat diagram explain the working of turbine governing. **(06 Marks)**
c. Mention the factors to be consider for the selection of site for hydro-electric power plant. **(04 Marks)**

Module-2

3 a. With a schematic diagram (layout) explain the working of steam power plant. **(06 Marks)**
b. Explain any three methods used for the disposal of ash in steam power plant. **(06 Marks)**
c. Mention the advantages and disadvantages of diesel power plant. **(04 Marks)**

OR

4 a. Explain how the use of regenerator, and reheater in gas turbine plants help in improvement in thermal efficiency. **(08 Marks)**
b. Describe the auxilliary equipment of diesel engine power plant. **(08 Marks)**

Module-3

5 a. With a neat diagram explain the working of main parts of nuclear reactor. **(08 Marks)**
b. What are the classification of nuclear reactors? Explain the operation of fast breeder reactor. **(08 Marks)**

OR

6 a. Explain the various methods of nuclear waste disposal. **(06 Marks)**
b. Mention the advantages and disadvantages of nuclear power plant. **(06 Marks)**
c. Mention the factors to be considered for the selection of site for nuclear power plant. **(04 Marks)**

Module-4

7 a. What is a protective relay? Explain its function in an electrical system. **(06 Marks)**
b. With a neat diagram explain the working of HRC (High Rupturing Capacity) fuse. **(06 Marks)**
c. Explain the working of rod gap arrester. **(04 Marks)**

OR

8 a. Draw the line diagram of 66/11 kV sub –station. (06 Marks)

b. With a neat sketch, explain ungrounded system in power system. (06 Marks)

c. Mention the advantages of neutral – grounding. (04 Marks)

Module-5

9 a. Define the following terms as applied to power system :

i) Load factor

ii) Demand factor

iii) Diversity factor

iv) Plant capacity factor. (08 Marks)

b. A power station is to supply three region of load whose peak loads are 20MW, 15MW and 25MW. The annual load factor is 50% and the diversity factor of the load at the station is 1.5. Determine the following :

i) Maximum demand on the station

ii) Installed capacity suggesting number of units

iii) Annual energy supplied. (08 Marks)

OR

10 a. What is power factor? Explain any one method of improving power factor. (06 Marks)

b. A power station has to supply load as follows:

Time (hours)	0 – 6	6 – 12	12 – 14	14 – 18	18 – 24
Load (MW)	30	90	60	100	50

i) Draw the load curve

ii) Draw load – duration curve

iii) Calculate the load factor. (06 Marks)

c. Define tariff. Explain :

i) Block rate tariff

ii) Two – part tariff. (04 Marks)

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CBCS Scheme

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15EE43

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
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. With usual notations derive an expression for the sag of a transmission line when the supports are at equal levels. **(06 Marks)**

b. Draw the line diagram of a typical transmission and distribution system indicating the standard voltage. **(05 Marks)**

c. Explain the various supporting structures used for the overhead transmission lines. **(05 Marks)**

OR

2 a. Derive an expression for string efficiency of a 3 disc string. **(06 Marks)**

b. What are the advantages of high voltage AC transmission line? **(04 Marks)**

c. The towers of height 30m and 90m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500m. If the tension in the conductor is 1600kg, find the minimum clearance of the conductor and water and also clearance midway between the supports. Weight of conductor is 1.5kg/m. Bases of the towers can be considered to be at water level. **(06 Marks)**

Module-2

3 a. Derive an expression for the inductance of a single phase two wire line. **(06 Marks)**

b. The three conductors of a 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 conductor is 1.24cm. **(05 Marks)**

c. Explain the process of transposition of transmission lines and its advantages. **(05 Marks)**

OR

4 a. Obtain an expression for potential difference between two conductors a and b in a system of n conductors. **(06 Marks)**

b. Calculate capacitance of 100km long 3-ϕ, 50Hz, overhead transmission line consisting of 3 conductors each of diameter 2cm and spaced 2.5cm at the corners of an equilateral triangle. **(05 Marks)**

c. Describe composite conductors. **(05 Marks)**

Module-3

5 a. Discuss the nominal T. Model of a medium transmission line with appropriate circuit diagram and phasor diagram and hence obtain the expression for regulation and A B C D constant for the same. **(10 Marks)**

b. A 110kV, 50Hz, 3-phase transmission line delivers a load of 40MW at 0.85 lagging pf at the receiving end. The generalized constants of the transmission line are $A = D = 0.95 \angle 1.4°$, $B = 96 \angle 78°$ ohm, $C = 0.0015 \angle 90°$ mho. Find the regulation of the line and charging current use nominal T method. **(06 Marks)**

OR

6 a. A 3-phase short transmission line delivers 3MW at a pf of 0.8 lagging to a load. If the sending ends voltage is 33kV. Determine : i) Receiving end voltage ii) Line current iii) Transmission efficiency iv) Regulation. The resistance and reactance of each conductor are 5Ω and 8Ω respectively. **(10 Marks)**

b. Explain Ferranti effect. **(06 Marks)**

Module-4

7 a. What is meant by grading of cable? Explain capacitance grading. **(08 Marks)**

b. A single core lead covered cable has a conductor diameter of 3cm with insulation diameter of 8.5cm. The cable is insulated with two dielectrics with permittivities 5 and 3 respectively. The maximum stresses in the two dielectrics are 38kV/cm and 26kV/cm respectively then calculate radial thickness of insulating layers and the working voltage of the cable. **(08 Marks)**

OR

8 a. Explain the phenomenon of corona in overhead transmission line. **(05 Marks)**

b. Find the most economical diameter of a single core cable to be used on 66kV, 3-phase system, if the peak permissible stress is not to exceed 50kV/cm. Also find the overall diameter. **(05 Marks)**

c. Draw the cross sectional view of a single core cable and explain its construction. **(06 Marks)**

Module-5

9 a. Explain with neat sketch different failure modes of bath tub curves. **(05 Marks)**

b. Briefly explain radial and ring main distributors. **(05 Marks)**

c. Four lines A, B, C and D are connected to a common point O. Resistance of AO, BO, CO and DO are respectively 1, 2, 3 and 4Ω both 90 and return and feeding points A, B, C and D are maintained at 230, 250, 240 and 220V respectively. Find the potential of common point O assuming no load is tapped from there. **(06 Marks)**

OR

10 a. What is power quality? What are different power quality problems? **(05 Marks)**

b. Explain the term MTTF and MTBF. **(03 Marks)**

c. An electric train taking a constant current of 500A moves between the two substations 6 kms apart. The two substations are maintained at 580V and 600V respectively. The track resistance is 0.05Ω per km both 90 and return. Calculate :

i) The point of minimum potential

ii) The currents supplied by each substation at the point of minimum potential. **(08 Marks)**

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15EE44

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
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 is back emf? Derive the armature torque equation of a DC metro. **(06 Marks)**

b. List the applications of DC motors. **(04 Marks)**

c. A 200V shunt motor with constant main field drives a load, the torque of which varies at the square of the speed. When running at 600 rpm, it takes 30A. Find the speed at which it will run and the current it will draw, if a 20Ω resistor is connected in series with the armature. Neglect the motor losses. **(06 Marks)**

OR

2 a. Draw the power flow diagram of a DC motor and derive the condition for minimum efficiency. **(06 Marks)**

b. Explain the characteristics of a DC shunt motor. **(05 Marks)**

c. Explain with circuit diagram, the armature control methods of DC series motors. **(05 Marks)**

Module-2

3 a. With neat diagram, explain the Swinburne's test on a DC motor. Mention the demerits of this test. **(05 Marks)**

b. Explain the test on a DC motor which determines the rotational losses **(05 Marks)**

c. Hopkinson's test on two machines gave the following results for full-load : line voltage = 230V, Line current excluding field current = 50A, motor armature current = 380A, field currents 5A and 4.2A. The armature resistance of each machine is 0.02Ω. Calculate the efficiency of each machine. **(06 Marks)**

OR

4 a. What is slip? Derive the maximum running torque equation of an induction motor. **(06 Marks)**

b. Draw and explain the torque–slip characteristics covering motoring, generating and breaking regions of operation. **(06 Marks)**

c. Explain the effect of rotor resistance on maximum torque and slip of an induction motor. **(04 Marks)**

Module-3

5 a. Derive the approximate equivalent circuit referred to stator of an induction motor. **(06 Marks)**

b. Explain with neat diagram the blocked rotor test on an induction motor. **(05 Marks)**

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

OR

6 a. Write the procedure of drawing the circle diagram. What information can be obtained from the circle diagram? **(06 Marks)**

b. With neat diagram, explain the construction of rotor of a double cage induction motor. **(05 Marks)**

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

Module-4

7 a. Why starter is necessary for an induction motor? With neat diagram, explain the operation of a start – Delta starter. **(06 Marks)**

b. Explain the stator voltage control of a three phase induction motor. **(05 Marks)**

c. A squirrel cage induction motor has a full-load slip of 4% and blocked rotor current of 6 times the full-load current. Find the percentage of tapping of the auto–transformer starter to give full-load torque on starting and the line current as a percentage of full–load current. **(05 Marks)**

OR

8 a. Explain with double –revolving field theory why the single phase induction motor is not self starting with phasor diagram. **(08 Marks)**

b. Explain with neat diagram, the working principle of capacitor start single phase induction motor. **(08 Marks)**

Module-5

9 a. Explain the operation of a synchronous motor under constant excitation and varying load. **(06 Marks)**

b. What is a synchronous condensor? What is its application? **(04 Marks)**

c. List the causes of hunting and effects of hunting in a synchronous motor. **(06 Marks)**

OR

10 a. With a neat diagram, explain the operation of a two–phase AC servomotor. **(08 Marks)**

b. What is a linear induction motor? Explain its principle of operation and draw the torque – speed characteristic. **(08 Marks)**

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10EE45

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Power Electronics

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Draw suitable sketches wherever necessary.***

PART – A

1 a. What is power electronics? Mention its industrial applications. **(05 Marks)**

b. With neat diagram and waveforms, explain control characteristics of (i) SCR and (ii) IGBT. **(08 Marks)**

c. Describe thyristorised tap changer with a neat schematic. **(07 Marks)**

2 a. Compare BJT, MOSFET and IGBT (any four points). **(04 Marks)**

b. For the circuit shown in Fig. Q2 (b) the details are given. The bipolar transistor is specified to have β_f in the range of 8 to 40. The load resistance is $R_C = 11\Omega$. The DC supply voltage is V_{CC} = 200 V and the input voltage to the base circuit is V_B = 10 V. If $V_{CE(sat)}$ = 1 V and $V_{BE(sat)}$ = 1.5 V find (i) the value of R_B that results in saturation with an ODF of 5, (ii) the β_{forced} and (iii) the power loss P_T in the transistor. **(10 Marks)**

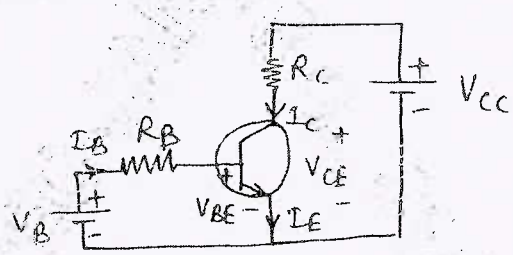

Fig. Q2 (b)

c. With a neat sketch describe the construction of IGBT. **(06 Marks)**

3 a. With the help of a two transistor model derive the expression for anode current for an SCR. **(10 Marks)**

b. Calculate the values of R, R_{B1} and R_{B2} for the following UJT trigger circuit. The parameters of UJT are $V_s = 30V$, $\eta = 0.51$, $I_p = 10\mu A$, $V_v = 3.5$ V and $I_v = 10mA$ and $C = 0.5\mu F$. Assume $V_D = 0.5$ and frequency of oscillations f = 60 Hz, width of the triggering pulse $t_g = 50\ \mu s$. **(10 Marks)**

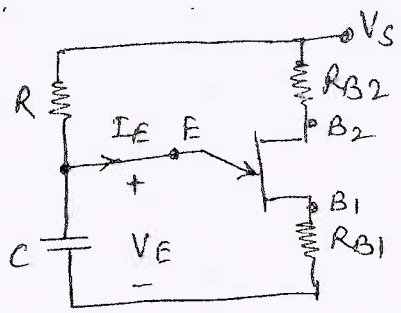

Fig. Q3 (b)

4 a. What do you mean by commutation in thyristors? Differentiate between natural and forced commutation. (06 Marks)

b. With the help of a schematic and waveforms explain complementary commutation. (08 Marks)

c. For the commutation circuit shown in Fig. Q4 (c) the DC source voltage is 120 V and the current through R_1 and R_2 = 20 A. The turn off time of both the SCRs is 60 μsec. Calculate the value of commutations capacitor C for successful commutation. (06 Marks)

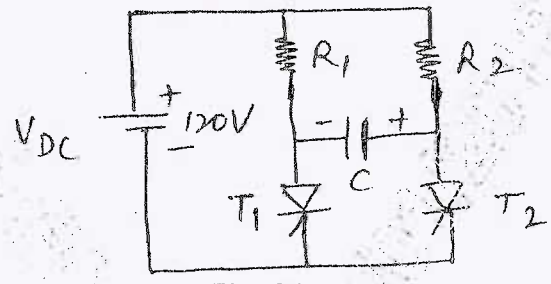

Fig. Q4 (c)

PART – B

5 a. With the help of a neat schematic and waveforms derive an expression for average output voltage of single phase semiconverter with RL load. (10 Marks)

b. A single phae half wave controlled rectifier is used to supply power to 10 Ω load from 230 V, 50 Hz supply at a firing angle of 30°. Calculate (i) Average output voltage (ii) Effective output voltage (iii) Average load current (iv) Effective load current. (10 Marks)

6 a. What is chopper? What are the various types of chopper? (06 Marks)

b. With the help of a schematic and waveform explain step down chopper. (08 Marks)

c. A stepdown chopper has a resistive load of 10 Ω and the input voltage is 220 V. When the chopper switch remains on its voltage drop is V_{ch} = 2 V and the chopping frequency is 1 kHz. If the duty cycle is 50% determine (i) The average output voltage (ii) the rms output voltage and (iii) the chopper efficiency. (06 Marks)

7 a. Describe various performance parameters of inverter. (06 Marks)

b. What are the drawbacks of single phase half bridge inverter? Explain the operation of single phase full bridge inverter for resistive load. (08 Marks)

c. With relevant waveforms, explain the sinusoidal pulse width modulation in an inverter. (06 Marks)

8 a. Explain the principle of ON-OFF and phase control of AC voltage regulators. (06 Marks)

b. With the help of circuit diagram and waveforms explain the operation of single phase AC voltage bidirectional controller with R-L load. Derive an expression for output voltage. (08 Marks)

c. A single phase fullwave AC voltage controller has a resistive load of 10 Ω. Input voltage is 120 V (rms), 60 Hz. The delay angle of each thyristor is 90°. Find (i) rms output voltage and (ii) input power factor. (06 Marks)

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15EE46

Fourth Semester B.E. Degree Examination, June/July 2018
Operational Amplifiers and Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Discuss the Ideal characteristics of an OPAMP. **(04 Marks)**

b. Show that the output of subtractor is proportional to the different between the two input voltages. **(06 Marks)**

c. Draw and explain the operation of peaking amplifier. **(06 Marks)**

OR

2 a. For a non inverting amplifier, the values of R_1 and R_f are 1KΩ and 10KΩ respectively. The various op-amp parameters are, open loop gain is 2×10^5, input resistance is 2MΩ, output resistance is 75Ω, single break frequency is 5Hz, supply voltage are ± 12V. Calculate the closed loop gain, Input Resistance, output Resistance and Bandwidth with feedback. **(08 Marks)**

b. What is an Instrumentation amplifier? For instrumentation amplifier using transducer bridge, obtain the expression for output voltage V_0 in terms of change in Resistance ΔR of the transducer. Draw the circuit diagram. **(08 Marks)**

Module-2

3 a. Derive the expression for the phase shift produced by an All pass Filter. **(08 Marks)**

b. With a neat diagram, explain the operation of a voltage follower regulator using OPAMP. **(08 Marks)**

OR

4 a. Explain the following performance parameters of voltage Regulator.
(i) Line Regulation (ii) Load Regulation (iii) Ripple Rejection. **(05 Marks)**

b. Design second order Low pass Filter for a cut-off frequency of 100Hz with capacitor selected as 0.1μF and draw the circuit diagram. **(05 Marks)**

c. Briefly explain with the help of schematic Diagram, the working of LM317 IC Regulator. **(06 Marks)**

Module-3

5 a. Draw and explain triangular wave generator using square wave generator and integrator method. Draw the required waveforms. **(10 Marks)**

b. With a neat circuit diagram and waveforms, explain the operation of inverting Schmitt trigger circuit with different LTP and UTP. **(06 Marks)**

OR

6 a. Using 741 OPAMP with a supply voltage of ± 12V, design a RC phase shift oscillator to have an output frequency of 3.5 KHz. Draw the circuit diagram. **(06 Marks)**

b. Draw and explain the operation of voltage to frequency converter using OPAMP. **(05 Marks)**

c. Design the wein bridge oscillator circuit to have output frequency of 10KHz. Use C = 0.01μF. **(05 Marks)**

Module-4

7 a. Design the precision full wave rectifier circuit to produce a 2V peak output from a sine wave input with a 0.5V peak value and 1MHz frequency. Use Bipolar OPAMPS with a supply voltage of ± 15V. Choose adequate diode current as 500μA. Draw the circuit diagram. **(06 Marks)**

b. Explain the successive approximation A/D converter technique with the help of block diagram. **(05 Marks)**

c. Sketch and explain the working of sample and Hold circuit. **(05 Marks)**

OR

8 a. With a neat circuit diagram, explain the operation of a high input impedance full wave precision rectifier. Draw the voltage waveforms at various points in the circuit and write the appropriate equations to show that full wave ratification is performed. **(08 Marks)**

b. Explain the working of Dual slope ADC with the help of neat diagram. **(08 Marks)**

Module-5

9 a. Draw and explain the functional block diagram of IC 555. **(08 Marks)**

b. Explain PLL IC 565 application as frequency multiplier and frequency synthesizer. **(08 Marks)**

OR

10 a. Design an Astable multivibrator having an output frequency of 10KHz with a duty cycle of 25%, using IC 555. Use C = 0.01μF. **(08 Marks)**

b. What is phase locked loop? Explain the working of the building blocks of PLL. **(08 Marks)**

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CBCS Scheme

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15EE46

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Operational Amplifiers and Linear IC's

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Standard resistance and capacitance data table may be used.
3. 741 Datasheet allowed.

Module-1

1 a. Draw the block diagram of Op-Amp and explain. **(08 Marks)**

b. In the circuit of AC inverting amplifier $R_{in} = 50\Omega$, $C_i = 0.1\mu F$, $R_1 = 100\Omega$, $R_F = 1k$, $R_L = 10k$ and supply voltages = ± 15V. Determine the bandwidth of the amplifier. ($uGB = 10^6$. K = 0.909 for 741 IC). **(08 Marks)**

OR

2 a. Derive the closed loop voltage gain equation for the voltage series feedback amplifier. **(08 Marks)**

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

Module-2

3 a. Derive the gain equation for first order low pass Butterworth filter. **(08 Marks)**

b. With diagram, explain the adjustable output regulator. **(08 Marks)**

OR

4 a. Explain in detail the all pass filter. **(08 Marks)**

b. Design an adjustable positive voltage regulator using LM317 for output voltage varying from 4 to 12V and output current of 1A. **(08 Marks)**

Module-3

5 a. Design a RC phase shift oscillator for an output frequency of 5 KHz. Use LM741 with ± 15V power supply. **(08 Marks)**

b. With circuit diagram and necessary derivation for load current, explain voltage – to -- current converter with grounded load. **(08 Marks)**

OR

6 a. Explain the oscillator amplitude stabilization with necessary figures. **(08 Marks)**

b. Design a non inverting Schmitt trigger circuit to have uTP = +3V and LTP = –5V. Use 741 Op-Amp with V_{CC} = ± 15V. **(08 Marks)**

Module-4

7 a. Explain the precision full wave rectifier circuit as a combination of half wave rectifier and summing circuit. **(08 Marks)**

b. With neat circuit explain three bit R – 2R DAC. **(08 Marks)**

OR

8 a. With diagram explain the working of Op-Amp sample and hold circuit. **(08 Marks)**

b. Explain the dual slope ADC with the necessary figure. **(08 Marks)**

Module-5

9 a. With block diagram, explain phase locked loop in detail. **(08 Marks)**

b. Sketch the circuit diagram of an Op-Amp monostable multivibrator, draw the circuit waveforms and explain its operation. **(08 Marks)**

OR

10 a. Write a note on applications of PLL IC 565. **(08 Marks)**

b. Explain the Astable multivibrator circuit operation using Op-Amp. **(08 Marks)**

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10EE44

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Field Theory

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing data, if any, may be suitably assumed.

PART – A

1 a. State and explain Coulomb's law for electrostatic force between two point charges. Represent force in vector form. **(05 Marks)**

b. Find electric flux density in Cartesian co-ordinate system at a point (6, 8, –10) due to :
i) A point charge of 60mc at the origin
ii) A uniform surface charge of density $\rho_S = 100\ \mu c/mt^2$ on the plane x = 12mt. **(08 Marks)**

c. Given the electric flux density $\vec{D} = 5\sin\theta\,\hat{a}_\theta - 5\sin\phi\,\hat{a}_\phi$. find the charge density of (0.7m, $\pi/2$, 2π) (spherical – coordinates). **(07 Marks)**

2 a. Obtain the boundary conditions between two perfect dielectrics. **(07 Marks)**

b. An electrostatic field is given by $\vec{E} = -12xy\,\hat{a}_x - 6x^2\,\hat{a}_y + \hat{a}_z$ V/m . The charge of 6c is to be moved from B(1, 8, 5) to A(2, 18, 6). Find the work done in each of the following cases :
i) The path selected is $y = 3x^2 + z$; $z = x + 4$
ii) The straight line from B to A
Show that the work done remains same and is independent of the path selected. **(08 Marks)**

c. Find the work done in assembling four equal point charges of 2 μc each on x and y axis at ±3m and ±4m respectively. **(05 Marks)**

3 a. Obtain Poisson's and Laplace's equations form Maxwell's first equation. **(06 Marks)**

b. State and prove uniqueness theorem. **(08 Marks)**

c. Determine whether or not the following potential fields satisfy the Laplace's equation :
i) $V = x^2 - y^2 + z^2$
ii) $V = r\cos\phi + t$
iii) $V = r\cos\theta + \phi$. **(06 Marks)**

4 a. Obtain on expression for magnetic field intensity of a point due to infinite conductor using Biot – Savart's law.. **(08 Marks)**

b. State and prove Ampere's circuital law as applied to magnetic field. **(05 Marks)**

c. Evaluate both sides of the Stoke's theorem for the field. $\vec{H} = 6xy\,\hat{a}_x - 3y^2\,\hat{a}_y$ A/m and the rectangular path around the region, $2 \le x \le 5$; $-1 \le y \le 1$; $z = 0$. Let the positive direction of $\vec{ds}$ be $\hat{a}_z$. **(07 Marks)**

PART – B

5 a. Discuss the magnetic boundary conditions to apply $\vec{B}$ and $\vec{H}$ at the interface between two different magnetic materials. **(06 Marks)**

b. Define self inductance. Derive an expression for self inductance of a co-axial cable. **(06 Marks)**

c. A rectangular loop in z = 0 plane has corners at (0, 0, 0), (1, 0, 0), (1, 2, 0) and (0, 2, 0). The loop carries a current of 5A in $\hat{a}_x$ direction. Find the total force produced by the magnetic field, $\vec{B} = 2\hat{a}_x + 2a_y - 4\hat{a}_z \text{ Wh/mt}^2$. **(08 Marks)**

6 a. Explain the interpretation of Faraday's law applicable to time varying magnetic field and derive an expressions for 'transformer e.m.f' and motional e.m.f. **(06 Marks)**

b. Derive the equation giving relation between $\vec{A}$ and V (Lorent'z condition for potentials from retarded potentials) **(07 Marks)**

c. A parallel plate capacitor with plate area of 5cm^2 and plate separation of 3mm has a voltage of 50 sin $(10^3 t)$ volts applied to its plates. Calculate the displacement current assuming $\epsilon = 2\epsilon_0$. **(07 Marks)**

7 a. Obtain the solution of wave equations for uniform plane wave propagating in free space. **(10 Marks)**

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

8 a. With necessary expression, explain (SWR) standing wave ratio. **(10 Marks)**

b. Derive the expressions for transmission co-efficient and reflection co-efficient. **(10 Marks)**

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10EE46

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Transformers and Induction Machines

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Explain the transformer action on no load and on load conditions. Draw the necessary vector diagrams. **(06 Marks)**

b. Distinguish between :
i) Power transformer and distribution transformer
ii) Current transformer and voltage transformer. **(06 Marks)**

c. A 2200/220V , 50Hz, single phase transformer has exciting current of 0.6A and a core loss of 361W, when its H.V side is energized at rated voltage. Calculate the two components of the exciting current (b) If the transformer of part (a) supplies a load current of 60A at 0.8pf lag on its I.V side, then calculate the primary current and its power factor. **(08 Marks)**

2 a. Derive the condition for maximum efficiency of a single phase transformer. **(04 Marks)**

b. Describe the test on a single phase transformer that gives ohmic losses and core losses. **(08 Marks)**

c. The following results were obtained on a 50KVA, 2400/120V transformer.
O.C. Test 396W, 9.65A, 120V – I.V. side
S.C. Test 810W, 20.8A, 92V – H.V. side
Determine :
i) the circuit constants
ii) the efficiency at full load. 0.8pf lag
iii) approximate voltage regulation
iv) draw the equivalent circuit referred to the secondary side. **(08 Marks)**

3 a. Why parallel operation of two transformers is necessary. **(04 Marks)**

b. Deduce the expression for the load shared by two transformers in parallel when the no load voltages are equal. **(08 Marks)**

c. Two single phase transformers share a load of 400 KVA at a power factor of 0.8 lagging. Their equivalent impedances referred to secondary windings are $(1 + j2.5)\Omega$ and $(1.5 + j3)\Omega$ respectively. Calculate the load shared by each transformer. **(08 Marks)**

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

b. What is an open delta system? What are the applications of this system? **(06 Marks)**

c. A 3-phase transformer is used to step down the voltage of a 3 - ϕ, 11KV feeder line. Per phase turns ratio is 12. For a primary line current of 20A, calculate the secondary line current, voltage and output KVA for the following connections : i) star delta ii) delta – delta iii) delta – star iv) star star. **(08 Marks)**

PART – B

5 a. Differentiate between slip ring and squirrel cage induction motor. Mention two applications for each. (06 Marks)

b. Derive the relationship for torque developed by a 3-phase induction motor. Draw a typical torque slip characteristic and deduce the condition for maximum torque. (08 Marks)

c. A 3-phase, 4-pole 1440rpm, 50Hz, induction motor has star connected rotor winding, having a resistance of 0.2Ω per phase and a standstill leakage resistance of 1Ω per phase. When the stator is energized at rated voltage and frequency, the rotor induced any at standstill is 120V per phase. Calculate the rotor current rotor power factor and torque both at starting and at full load. (06 Marks)

6 a. Draw the induction motor phasor diagram at :
i) Standstill ii) at a full load slip S.
Draw the equivalent cc diagram of the induction motor. (06 Marks)

b. Explain the no load and blocked rotor test on a 3-phase induction motor. How are the parameters of equivalent circuit determined from the test results? (06 Marks)

c. The power input to a 6-pole, 3-phase, 50Hz induction motor is 42 KW, the speed is 970 rpm. The stator losses are 1.2KW and the friction and wind age losses are 1.8 KW. Find : i) slip ii) the rotor copper loss iii) the BHP iv) efficiency. (08 Marks)

7 a. Describe with sketches, the construction of a double cage induction motor and point out its advantages compared with a single cage motor. (08 Marks)

b. Why starters are necessary of starting induction motors? Name different starting methods for 3-phase induction motor. (06 Marks)

c. At standstill, the equivalent impedances/phase of the inner and outer cages of a double cage rotor as referred to stator are $(0.4 + j2)\Omega$ and $(2 + j4)\Omega$ respectively. Calculate the ratio of torques produced i) at standstill ii) at 5% slip. (06 Marks)

8 a. Write the speed equation of the 3-phase induction motor. Explain the method of speed control of 3-phase induction motor by varying the rotor resistance. (06 Marks)

b. Why single phase induction motor are not self starting. Explain different methods of starting the single phase induction motor. (08 Marks)

c. Write the note on circle diagram of an induction motor. (06 Marks)

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15EE33

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018

Transformers and Generators

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain operation of a practical transformer on load. Also draw the phasor diagram. **(06 Marks)**

b. Show that open delta connection has a kVA rating of 58% of the rating of the normal delta-delta connection. Also list the limitations of open-delta connection. **(06 Marks)**

c. A 20 kVA single phase transformer has voltage rating of 1100/110 V. During short circuit test it gives the following readings: 60V, 18 A, 560 W, LV side shorted. Find the power factor at which the regulation is (i) maximum, (ii) zero. **(04 Marks)**

OR

2 a. Define regulation of a transformer and obtain regulation of transformer by OC and SC tests. **(06 Marks)**

b. With the help of phasor diagram, explain how 2 phase supply can be obtained from 3 phase supply using Scott connection. **(06 Marks)**

c. A three phase step down transformer with per phase turns ratio 47.6:1 connected in delta/star and is supplying a load of 400 KW, 0.8 power factor lagging at 400 V. Sketch the connection diagram and show in it, the line voltages, phase currents and line currents. **(04 Marks)**

Module-2

3 a. List the conditions to be satisfied for satisfactory parallel operation of both single phase and three phase transformers. **(05 Marks)**

b. A 10 KVA 230/110 V transformer is to be used as a step up transformer to step up 230 V to 340 volts what will be the output rating of the autotransformer. **(04 Marks)**

c. What is the necessity of tertiary winding and explain its operation in star/star transformers. **(07 Marks)**

OR

4 a. Derive an expression for copper saving in autotransformer. **(05 Marks)**

b. Two transformers each of 80 kVA are connected in parallel. One has a resistance and reactance of 1% and 4% respectively and the other has resistance and reactance of 1.5% and 6% respectively. Calculate the load shared by each transformer and the corresponding power factor when the total load shared is 100 kVA at 0.8 power factor lagging. **(06 Marks)**

c. How do you obtain the equivalent circuit of a three winding transformer? Explain. **(05 Marks)**

Module-3

5 a. Explain in rush current phenomenon in transformers. **(05 Marks)**

b. A four pole lap wound armature running at 1400 rpm delivers a current of 100 A and has 64 commutator segments. The brush width is equal to 1.4 segments and inductance of each coil is 0.05 mH. Calculate the value of reactance voltage assuming (i) linear commutation, (ii) sinusoidal commutation. **(05 Marks)**

c. Explain any one method used to reduce the armature reaction effects in a dc machine. **(06 Marks)**

OR

6 a. What are the causes and effects of harmonics in a transformer? Explain. **(05 Marks)**

b. An 8 pole wave connected dc generator has 480 armature conductors. The armature current is 200 A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole if the brushes are shifted 6° electric from geometric neutral axis. Also calculate compensating turns per pole if the pole arc to pole pitch ratio is 0.75. **(05 Marks)**

c. Derive an expressions for distribution factor K_d and pitch factor K_p. **(06 Marks)**

Module-4

7 a. Explain slip tests on salient pole synchronous machine. **(05 Marks)**

b. Discuss the effect of change of excitation at constant load. **(05 Marks)**

c. Two identical 2000 kVA alternators operate in parallel. The governor of the prime mover of the first machine is such that the frequency drops uniformly from 50 Hz on no load to 48 Hz on full load. The corresponding uniform speed drop of the second machine is 50 Hz to 47.5 Hz. Find how will the two machines share a load of 3000 KW. **(06 Marks)**

OR

8 a. Derive an expression for synchronizing power. **(05 Marks)**

b. A 3 phase star connected synchronous generator supplies current of 10 A having phase angle of 20° lagging at 400 V. Find the load angle and components of armature current I_d and I_q, if $X_d = 10\ \Omega$ and $X_q = 6.5\ \Omega$. Assume armature resistance to be negligible. **(06 Marks)**

c. Derive an expression for the output power of cylindrical rotor altenator connected to infinite bus. Neglect armature resistance. **(05 Marks)**

Module-5

9 a. Differentiate between synchronous reactance, adjusted synchronous reactance and potier reactance. **(06 Marks)**

b. A 2300 V, 50 Hz, 3 phase star connected alternator has an effective armature resistance of 0.2 ohm. A field current of 35 A produces a current of 150 A on short circuit and an open circuit emf 780 V (line value). Calculate the voltage regulation at 0.8 pf lagging. The full load current is 25 A. **(06 Marks)**

c. Describe Hunting in alternator. **(04 Marks)**

OR

10 a. A 3.5 MVA, star connected altenator rated at 4160 volts at 50 Hz has open circuit characteristics as given by the following data:

I_f Amp	50	100	150	200	250	300	350
V_{oc} Volts	1620	3150	4160	4750	5130	5370	5550

A field current of 200 A is found necessary to circulate full load current on short circuit. Calculate by Ampere turn method full load voltage regulation at 0.8 pf lagging. **(08 Marks)**

b. Define short circuit ratio. What is the relation between short circuit ratio and synchronous reactance? **(04 Marks)**

c. List the advantages and disadvantages of synchronous impedance method of computing the regulation. **(04 Marks)**

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15EE34

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Analog Electronics Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain the different biasing circuits of BJT. for each circuit find an expression for stability factor. Also describe how to find the Q point of the circuit. **(09 Marks)**

b. Draw the circuit of voltage divider bias. Take the circuit parameters as, $V_{CC} = 10$ V, $R_2 = 17$ KΩ, $R_1 = 83$ KΩ, $R_C = 2$ KΩ, $R_E = 0.5$ KΩ, find Q point and terminal voltages. The transistor has $\beta = 100$ and $V_{BE} = 0.7$ V. **(07 Marks)**

OR

2 a. Explain the operation of transistor as a switch with the help of neat circuit diagram and waveforms. Also enumerate the design procedure. **(08 Marks)**

b. For the following circuit, find the Q point. **(08 Marks)**

Take $V_{CC} = 10$ V, $R_C = 1$ KΩ, $R_E = 0.5$ KΩ, $\beta = 50$, $V_{BE} = 0.7$ V

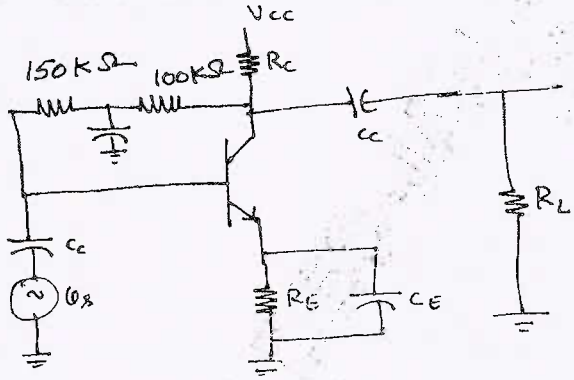
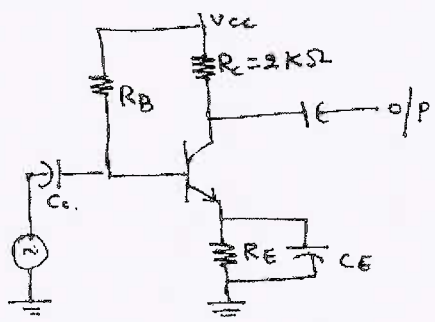


Fig. Q2 (b)

Module-2

3 a. Draw the circuit of emitter follower with voltage divider biasing and derive expressions for current gain, voltage gain input and output impedances. **(08 Marks)**

b. For the following circuit find current gain, voltage gain, input and output impedances. **(08 Marks)**



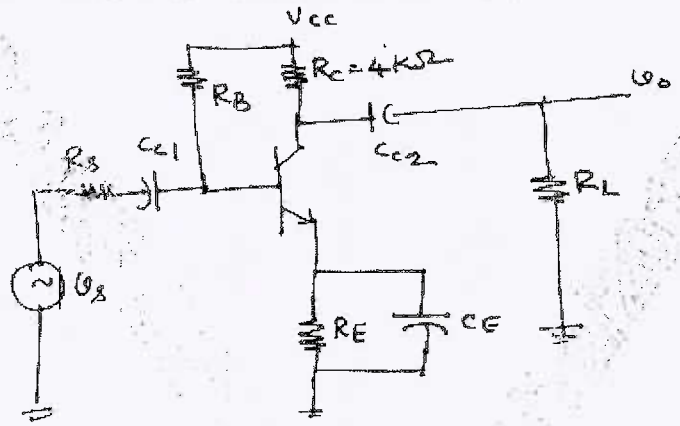
$R_B = 10$ KΩ
$h_{ie} = 1$ KΩ
$h_{re} = 10^{-4}$
$h_{fe} = 100$
$h_{oe} = 12$ μ℧

Fig. Q3 (b)

OR

4 a. With neat diagrams derive expressions for Miller capacitances (C_{MI} and C_{MO}). **(08 Marks)**

b. For the following circuit find the lower cut-off frequency. **(08 Marks)**



R_B = 10 KΩ
R_L = 4 KΩ
R_E = 1 KΩ
R_S = 2 KΩ
h_{ie} = 1 KΩ
h_{fe} = 100
C_{C1} = 0.1 μF
C_{C2} = 0.2 μF
C_E = 47 μF

Fig. Q4 (b)

Module-3

5 a. Two amplifiers are cascaded. The load resistance R_L = 20 KΩ and internal resistance of the voltage source is 2 KΩ. Find the

(i) Loaded voltage gain of each stage.
(ii) Total voltage gain of cascaded amplifier with R_S.
(iii) Current gain of cascaded amplifier.
(iv) Output impedance.

The first stage bias No load voltage gain = 1, Input impedance = 500 KΩ, Output impedance = 1 K, The second stage has a no load voltage gain of 300, input impedance of 1 KΩ and output impedance of 50 KΩ **(08 Marks)**

b. With neat diagrams explain cascade amplifier. **(08 Marks)**

OR

6 a. Derive suitable expression to explain the effect of negative feedback on, (i) Gain stability (ii) Distortion in amplifier. **(08 Marks)**

b. The open loop gain of an amplifier is subjected to variation of ±10% due to changes in temperature. Using such an amplifier design a feedback amplifier such that the closed loop gain of the amplifier is 150±1%. Find the value of open loop gain of the amplifier and feedback factor. **(08 Marks)**

Module-4

7 a. Draw the circuit of class-A transformed amplifier and explain its operation. Derive an expression for maximum efficiency of conversion with the help of neat waveforms. **(08 Marks)**

b. A transistor amplifier has zero signal collector current of 40 mA. When an a.c. source is connected, the dc collector current is 50 mA. The peak fundamental current in collector is 30 mA. Find second harmonic distortion and output ac power. **(08 Marks)**

OR

8 a. Draw the circuit of Wien bridge oscillator and explain its operation. Also derive an expression for frequency of oscillation. **(10 Marks)**

b. Explain with neat circuit diagram, the operation of crystal oscillator and write the expression for frequency of oscillation. **(06 Marks)**

Module-5

9 a. With neat diagrams, explain the construction, working and static characteristics of n-channel JFET. **(08 Marks)**

b. Draw the circuit of common source amplifier with bypass capacitor and derive an expression for voltage gain and output impedance. **(08 Marks)**

OR

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

b. A common source amplifier without bypass capacitor has $R_D = 2\,K\Omega$. $R_S = 1\,K\Omega$. $R_G = 1\,M\Omega$, find voltage gain and output impedance $g_m = 2m\,\mho$. **(08 Marks)**

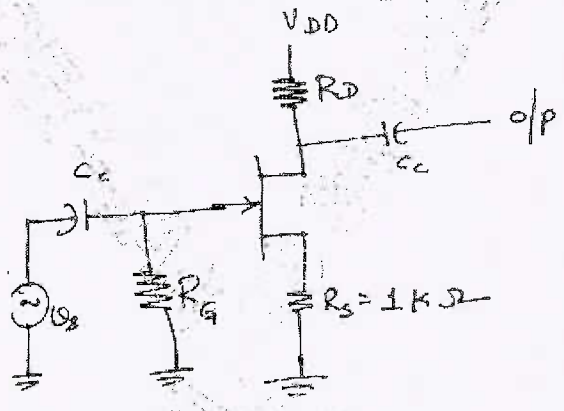


Fig. Q10 (b)

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15EE35

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
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. With basic block diagram, explain the combinational logic circuit. **(04 Marks)**

b. Reduce the following function using K-map technique and implement using basic gates

i) $f(P, Q, R, S) = \sum m(0, 1, 4, 8, 9, 10) + d(2, 11)$

ii) $f(A, B, C, D) = \pi M(0, 2, 4, 10, 11, 14, 15)$ **(12 Marks)**

OR

2 a. Simplify using the Quine-Mcclusky minimization technique.
$Y = f(a, b, c, d) = \sum m(0, 2, 8, 10)$ **(08 Marks)**

b. Simplify the given function using MEV technique.
$f(a, b, c, d) = \sum(2, 3, 4, 5, 13, 15) + \sum d(8, 9, 10, 11)$. **(08 Marks)**

Module-2

3 a. With the aid of general structure, clearly distinguish between a decoder and encoder. **(05 Marks)**

b. Implement following multiple output function using one 74LS138 and external gates.
$F_1(A, B, C) = \sum m(1, 4, 5, 7)$
$F_2(A, B, C) = \pi M(2, 3, 6, 7)$ **(06 Marks)**

c. Draw the interfacing diagram of ten keypad interface to a digital system using decimal to BCD encoder (IC 74LS147: Decimal to BCD priority encoder). **(05 Marks)**

OR

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

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

Module-3

5 a. What is the difference between a flip-flop and a latch? With logic diagram and truth table, explain the operation of gated SR latch. **(08 Marks)**

b. Explain the operation of Master slave JK Flip-flop along with its circuit diagram. **(08 Marks)**

OR

6 a. Explain the working principle of four bit binary ripple counter, with the help of a logic diagram, timing diagram and counting sequence. **(10 Marks)**

b. With logic diagram and counting sequence explain Mod – 4 ring counters. **(06 Marks)**

Module-4

7 a. Distinguish between Moore and Mealy model with necessary block diagrams. **(08 Marks)**

b. Give output function, transition table and state diagram by analyzing the sequential circuit shown in Fig. Q7(b). **(08 Marks)**

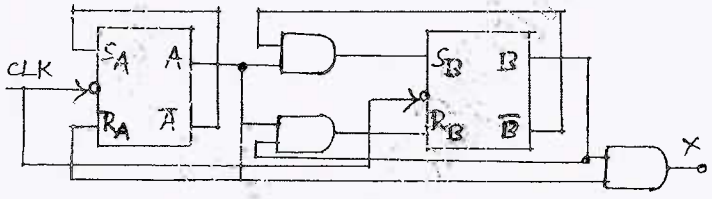

Fig. Q7(b)

OR

8 a. Write the basic recommended steps for the design of a clocked synchronous sequential circuit. **(06 Marks)**

b. Design a synchronous counter using J-K flip flops to count the sequence 0, 1, 2, 4, 5, 6, 0, 1, 2. Use state diagram and state table. **(10 Marks)**

Module-5

9 a. Explain brief history of HDL and structure of HDL module. **(06 Marks)**

b. List the classification of VHDL data types. Compare the VHDL data types and Verilog data types. **(10 Marks)**

OR

10 a. Explain signal declaration and signal assignment statements with relevant example. **(06 Marks)**

b. Write a data flow description VHDL for a system that has three 1-bit inputs a (1), a(2) and a(3) one 1-bit output b. The least significant bit is a(1) ; and b is 1, only when (a(1) a(2) a(3)) = 1, 3, 6 or 7 (all in decimal) otherwise b is 0. Derive a minimized Boolean function of the system and write the data flow description. **(10 Marks)**

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15EE36

Third Semester B.E. Degree Examination, June/July 2018
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. Discuss limitations of Wheatstone Bridge and explain how low resistance is measured by KDB. **(08 Marks)**

b. For an ac bridge evaluate unknown impedance in the arm DC when bridge is balanced at 2khz with following components in each arm.
Arm AB: 10kΩ
Arm BC: 100μF series with 100kΩ
Arm AD: 50kΩ
Detector is connected between B and D. **(08 Marks)**

OR

2 a. Obtain the dimensional equations in SI units for
i) Absolute permeability ii) Absolute permittivity. **(06 Marks)**

b. Discuss how capacitance of the capacitor is measured by Schering bridge. **(10 Marks)**

Module-2

3 a. Reproduce the errors in 1-ϕ kWh meter and explain how energy meter calibrated. **(08 Marks)**

b. A 1-ϕ energy meter operating at normal 1-ϕ voltage has a constant load of 4A passing through it for 6 hrs at 0.8 power factor. If the meter disc makes 2209 revolutions during this period, what is the meter constant in revolutions/kWh? Calculate the power factor of the load if the number of revolutions made by meter are 1472 when operated at normal 1-ϕ AC supply at 5A for 4 hrs. **(08 Marks)**

OR

4 a. Explain the construction and operating principle of Weston frequency meter and 1-ϕ pf meter. **(08 Marks)**

b. Discuss phase sequence indicator. **(03 Marks)**

c. A Wattmeter has current coil and pressure coil resistance of 0.2Ω and 5000Ω respectively. Evaluate the percentage of error in the Wattmeter reading when load takes 20A, at 250V with 0.8 pf lag for two methods of connection of Wattmeter. **(05 Marks)**

Module-3

5 a. Discuss Silsbee's method of testing CT. **(08 Marks)**

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

OR

6 a. Discuss how the iron losses are measured by using Wattmeter. **(07 Marks)**

b. List advantages of instrument transformers. **(02 Marks)**

c. Discuss how leakage flux is measured. **(07 Marks)**

Module-4

7	a.	List advantages of electronic meters over the conventional meters.	(03 Marks)
	b.	Discuss construction and operation of TRUE RMS reading voltmeter.	(05 Marks)
	c.	List characteristics of DVM and explain successive approximation type DVM.	(08 Marks)

OR

8	a.	Explain the principle of operation Q meter and discuss different application of Q-meter.	(08 Marks)
	b.	List different types of DVM. Explain with sketch the Ramp type DVM.	(08 Marks)

Module-5

9	a.	Explain why recorders are essential? With sketch explain x-y recorder.	(08 Marks)
	b.	Discuss with necessary figure i) ECG ii) EEG.	(08 Marks)

OR

10	a.	Write a short notes on i) LED ii) Nixie tube iii) LCD.	(08 Marks)
	b.	With neat sketch explain LVDT recorder.	(05 Marks)
	c.	Write a short note on dot matrix display.	(03 Marks)

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15EE36

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Electrical and Electronic Measurements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. All symbols and anonyms have their usual meaning.

Module-1

1 a. Derive the dimensions of the following quantities with mass, length, time and current as the fundamental units :
i) Inductance ii) Capacitance iii) Electric Flux iv) Resistance v) Resistivity. **(06 Marks)**

b. Illustrate with neat sketch, Kelvin double bridge to measure the internal resistance of an ammeter accurately. **(06 Marks)**

c. The Thevenin's equivalent voltage of a Wheatstone bridge is 25mV and the galvanometer current is 20μA. The resistance of the galvanometer is 50Ω. The ratio arms have resistances of 1000Ω and 5000Ω respectively. Find the value of the standard resistance for which the above conditions are satisfied. The value of the resistance to be measured is 600Ω. **(04 Marks)**

OR

2 a. Discuss the fall of potential method of measurement of earth resistance. **(04 Marks)**

b. With the neat circuit diagram, describe the operation of Maxwell Wein Bridge. List its merits and demerits. **(06 Marks)**

c. Discuss the method of determining capacitance and dissipation factor using how voltage Schering bridge. **(06 Marks)**

Module-2

3 a. Discuss the errors and their compensating techniques used in dynamometer type Wattmeter. **(05 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 = 0.2 Ω and 5000Ω. **(05 Marks)**

OR

4 a. Discuss the construction and working principle of electrodynamometer type single phase power factor meter. **(06 Marks)**

b. Explain the errors in a LPF wattmeter and give the adjustments done to compensate for the errors. **(05 Marks)**

c. Explain the working principle of Weston frequency meter. **(05 Marks)**

Module-3

5 a. Discuss the procedure used to extend the range of DC ammeter and DC volt meter using shunts and multipliers. (07 Marks)

b. Describe the operation of a current transformer using a phasor diagram. Differentiate a current transformer from a potential transformer. (09 Marks)

OR

6 a. A moving coil instrument has a resistance of 50hm and gives a full scale reading of 50mA. Calculate :

i) The shunt resistance required to increase the range to 200A

ii) The series resistance required to use it as a voltmeter of range 0 – 750V

iii) Power consumed in both the cases. (09 Marks)

b. Describe the operation of potential transformer using equivalent circuit and phasor diagram. (07 Marks)

Module-4

7 a. Using a block diagram schematic, explain the working of an electronic energy meter. List the drawbacks of traditional energy meter. (08 Marks)

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

i) True rms reading voltmeter

ii) Q meter. (08 Marks)

OR

8 a. With neat sketch, explain the working of the following :

i) Integrating type DVM

ii) Ramp type DVM. (08 Marks)

b. Explain the working of electronic multimeter. (08 Marks)

Module-5

9 a. With a neat sketch explain the working of cathode ray tube. (08 Marks)

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

i) LED display

ii) LCD display. (08 Marks)

OR

10 a. With appropriate sketch explain the working of strip chart recorder. (08 Marks)

b. Write short notes on the following :

i) X – Y recorders

ii) LVDT type recorder. (08 Marks)

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15EE42

Fourth Semester B.E. Degree Examination, June/July 2018
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. What is hydrological cycle? **(02 Marks)**
b. Describe the merits and demerits of hydroelectric power –plants. **(08 Marks)**
c. What are the characteristics of a water turbine? **(06 Marks)**

OR

2 a. What is meant by the phenomenon 'water hammer? Explain how a surge tank helps in reducing water hammer effect. **(05 Marks)**
b. Explain working of pumped shortage power plant, stating its advantages with the help of a schematic diagram. **(08 Marks)**
c. Define impulse and reaction type of turbines. **(03 Marks)**

Module-2

3 a. What are the main considerations for selection of site for a thermal power station? **(08 Marks)**
b. Explain briefly the functions of : i) Reheaters ii) Condensers. **(06 Marks)**
c. What do you understand by fluidized bed combustion? **(02 Marks)**

OR

4 a. Explain the filed of applications of diesel power plants. **(08 Marks)**
b. Describe the working of closed cycle gas turbine power-plant with a schematic diagram. **(08 Marks)**

Module-3

5 a. Describe the operation of nuclear power plant with the help of a block diagram showing basic components. **(07 Marks)**
b. Describe fast breeder reactors, stating its advantages. **(07 Marks)**
c. What is nuclear fission? **(02 Marks)**

OR

6 a. With a neat diagram, explain main parts and their function of a nuclear reactor. **(08 Marks)**
b. Explain with respect to a nuclear plant : i) Nuclear waste disposal ii) Shielding. **(06 Marks)**
c. What is meant by radio activity? **(02 Marks)**

Module-4

7 a. What are the functions of a sub-station? **(06 Marks)**
b. List out the advantages and disadvantages of outdoor substation over indoor substation. **(06 Marks)**
c. What do you understand by : i) switch gear ii) protective relay. **(04 Marks)**

OR

8 a. Explain : i) resistance grounding and ii) reactance grounding, stating where they are employed. **(06 Marks)**

b. State the functions of : i) current limiting reactor ii) lighting arrester iii) fuse. **(06 Marks)**

c. Give the classification of sub–stations. **(04 Marks)**

Module-5

9 a. Describe the classification of cost of electricity. **(06 Marks)**

b. What are the factors to be considered while deciding the number of generating units? **(06 Marks)**

c. Define : i) cold reserve ii) hot reserve iii) operating reserve iv) spinning reserve. **(04 Marks)**

OR

10 a. Define : i) demand factor ii) diversity factor. **(04 Marks)**

b. Describe types of consumers and their tariffs. **(06 Marks)**

c. Explain the disadvantages of low power factor. **(06 Marks)**

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CBCS Scheme

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15EE43

Fourth Semester B.E. Degree Examination, June/July 2018
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. What are the advantages of high voltage transmission? Explain. **(06 Marks)**

b. A transmission line has a span of 275m between level supports. The conductor has an effective diameter of 1.96cm and weighs 0.865kg/m. The ultimate strength is 8060 kg. If the conductors has ice coating of radial thickness 1.27cm and is subjected to a wind pressure of 3.9gm/cm^2 of projected area, calculate sag for a safety factor of 2. Weight of 1cc of ice is 0.91gm. **(10 Marks)**

OR

2 a. Draw a schematic diagram and hence briefly describe feeders, distributors and service mains. **(06 Marks)**

b. A 3-phase overhead transmission line is supported by 3 suspension type insulators. The potentials across first and second insulators are 8 KV and 11 KV respectively. Calculate : i) ratio of self to shunt capacitance ii) line voltage iii) string efficiency. **(06 Marks)**

c. Write a short note on vibrations of conductors. **(04 Marks)**

Module-2

3 a. Derive an expression for the inductance of a conductor due to internal and external flux. **(10 Marks)**

b. Calculate inductance of each conductor in a 3-phase 3 wire system. The conductors are arranged as shown in Fig.3(b). The conductors are transposed and have a diameter of 2.5cm. **(06 Marks)**

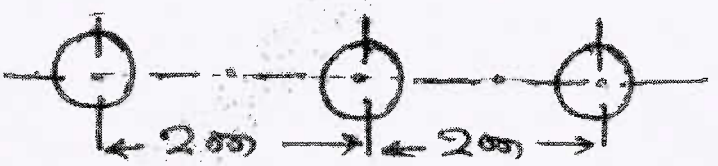

Fig.Q3(b)

OR

4 a. Derive an expression for the line to neutral capacitance for a 3-phase overhead transmission line when the conductors are unsymmetrically spaced. **(10 Marks)**

b. If the double circuit 3-phase line has conductors of diameter 2cm and are separated with 2m in hexagonal spacing arrangement. Calculate phase to neutral capacitance for 100km line. **(06 Marks)**

Module-3

5 a. Explain the nominal π method for obtaining the performance calculations of medium transmission line. Draw the corresponding vector diagram. **(08 Marks)**

b. A 3-phase, 50Hz overhead transmission line of 100km has the following constants. Resistance per km per phase is 0.1Ω, inductive reactance per km per phase is 0.2Ω, capacitive susceptance per km per phase is 0.4×10^{-14}℧. Find :

i) Sending end current
ii) Sending end voltage
iii) Sending end p.f
iv) Transmission efficiency

when supplying a balanced load of 10,000 KW at 66KV with a lagging p.f. of 0.8. Use nominal T–method. **(08 Marks)**

OR

6 a. Derive an expression for ABCD constants of a medium transmission line using nominal T–method. Show that AD – BC = 1. **(10 Marks)**

b. Write a short note on 'Ferranti effect'. **(06 Marks)**

Module-4

7 a. Derive an expression for critical disruptive voltage and visual critical voltage with reference to corona. **(06 Marks)**

b. A 132KV line with 1.956cm dia. conductors is built so that corona takes place if the line voltage exceeds 210KV(rms). If the value of potential gradient at which ionization occurs can be taken as 30 Kv/cm. Find the spacing between the constructors. **(06 Marks)**

c. Explain the factors affecting corona in brief. **(04 Marks)**

OR

8 a. What are the methods of grading of cables? Explain intersheath grading of cable. **(09 Marks)**

b. Derive an expression for the insulation resistance of a single core cable. **(07 Marks)**

Module-5

9 a. Briefly explain radial and ring main distributors. **(07 Marks)**

b. Draw the schematic diagram and hence obtain the expressions for voltages at different tapping points of a DC distributor fed at one end with concentrated loads. **(09 Marks)**

OR

10 a. A two–wire distributor AB, 600m long is loaded as –

Distance from A (mtrs)	150	300	350	450
Loads in Amps	100	200	250	300

The feeding point A is maintained at 440V and that of B at 430V. If each conductor has a resistance of 0.01Ω per 100m, Calculate :

i) The currents supplied from A and B
ii) The power dissipated in the distributor. **(12 Marks)**

b. What are the requirements of good distribution system? **(04 Marks)**

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15EE44

Fourth Semester B.E. Degree Examination, June/July 2018
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. Derive torque equation of a D.C. Motor. **(04 Marks)**

b. Explain why a D.C. series motor should never run unloaded. **(04 Marks)**

c. A 220V D.C. series motor is running at a speed of 800 rpm and draws 100A. Calculate at what speed the motor will run when developing half the torque. Total resistance of the armature and field is 0.1Ω. Assume that the magnetic circuit is unsaturated. **(08 Marks)**

OR

2 a. Describe the working of three point starter with neat sketch. What are its limitations? **(10 Marks)**

b. What are the losses that occur in DC machines? Derive the condition for maximum efficiency of a D.C. motor. **(06 Marks)**

Module-2

3 a. Explain briefly Field's test for determination of efficiency of DC series machines. **(08 Marks)**

b. The Hopkinson's test on two shunt machines gave the following results for full load :
Line voltage = 230 V.
Armature currents of motor and generator are 37A and 30A respectively.
Field currents of motor and generator are 0.85A and 0.8A respectively.
Calculate the efficiency of the motor and generator. Assume resistance of each machine for the armature as 0.33Ω. **(08 Marks)**

OR

4 a. Discuss the torque – slip characteristics of a three phase induction motor including motoring generating and braking regions. **(12 Marks)**

b. A 8 – pole , 50Hz induction motor has an emf in the rotor of frequency 1.5Hz. Determine the slip and speed of the motor. **(04 Marks)**

Module-3

5 a. Starting from the first principles develop the equivalent circuit of a 3 – phase induction motor. **(08 Marks)**

b. Explain Cogging and Crawling in 3 – phase induction motor. **(08 Marks)**

OR

6 a. Describe the construction and working of a Double – Cage induction motor. **(08 Marks)**

b. Explain the principle of operation of an Induction Generator. What are its limitations? **(08 Marks)**

Module-4

7 a. Explain the method of speed control of 3 – ϕ Induction motor by varying the rotor resistance. **(06 Marks)**

b. Explain the construction and working of Star – delta starter with derivation. **(10 Marks)**

OR

8 a. Explain Double Revolving Field theory of Single – Phase Induction motor with a neat sketch. **(08 Marks)**

b. Explain construction and working principle of a Shaded – Pole Motors. **(08 Marks)**

Module-5

9 a. Explain the operation of synchronous motor at constant load variable excitation with phasor diagram. **(08 Marks)**

b. A synchronous motor developing 20KW is connected in parallel with a factory load of 200KW at a p.f of 0.8 lag. If the total load connected to the supply has a p.f of 0.92 lag, what is the value of reactive power taken by the motor and at what p.f is it operating? **(08 Marks)**

OR

10 a. Explain the construction and working principle of a Universal Motor. **(08 Marks)**

b. Write short note on Linear Induction Motor. **(04 Marks)**

c. Write short note on Stepper Motor. **(04 Marks)**

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15EE45

Fourth Semester B.E. Degree Examination, June/July 2018
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. Two points A and B have the following orientations.
A(2.614, 7.369, –3.079) and B (3.162, 7.023, –2.318)
Check whether $\overrightarrow{AB}$ is a unit vector. **(05 Marks)**

b. Given two points, C(–3, 2, 1) and D(r = 5, θ = 20°, ϕ = –70°)
Find (i) The spherical coordinates of C
(ii) The rectangular coordinates of D
(iii) The distance from C to D. **(06 Marks)**

c. Two point charges Q_1 = 100 μC and Q_2 = 100 μC are located at points $(-1, 1, -3)_m$ and $(3, 1, 0)_m$ respectively. Find the X, Y & Z components of the forces on Q_1. **(05 Marks)**

OR

2 a. Determine the electric field intensity at a point 'A' located at distance 0.3m and 0.4m respectively from charges Q_1 and Q_2 spaced 0.5m apart. Given $Q_1 = 1\times10^{-9}$ C and $Q_2 = 8\times10^{-10}$ C. **(06 Marks)**

b. State and prove Gauss Divergence theorem. **(06 Marks)**

c. If $\overline{D} = 9x^3\hat{a}_x + 5y^2\hat{a}_y + 2z\hat{a}_z$ c/m^2, find the charge density at the point (1, 5, 9)m. **(04 Marks)**

Module-2

3 a. Prove that electric field intensity is expressed as negative gradient of scalar potential. **(05 Marks)**

b. Prove that the potential at a point P due to a charge disc at distance 'r' is $\frac{Q}{4\pi\epsilon_0 r}$ V. **(06 Marks)**

c. A parallel plate capacitor consists of 3 dielectric layers if
$\epsilon_1 = 1$, $d_1 = 0.4$ mm
$\epsilon_2 = 2$, $d_2 = 0.6$ mm
$\epsilon_3 = 1$, $d_3 = 0.8$ mm
and the area of cross section is 20 cm^2, find its capacitance C. **(05 Marks)**

OR

4 a. Find the electric field strength at the point (1, 2, –1) given the potential $V = 3x^2y + 2yz^2 + 3xyz$. **(05 Marks)**

b. An electric field of strength 3 V/m in air enters a dielectric medium. The orientation of electric fields with respect to boundary in air and dielectric are 30 and 60 respectively. Find the relative permeability of the dielectric. Also find the electric field strength in the dielectric. **(06 Marks)**

c. Determine the capacitance of a capacitor consisting of two parallel plates 30cm × 30cm surface area separated by 5 mm in air. What is the total energy stored by the capacitor is capacitor is charged to a potential difference of 500 V? What is the energy density? **(05 Marks)**

Module-3

5 a. Derive Poisson's and Laplace's equations. Write Laplace's equations in cylindrical and spherical coordinate system. **(06 Marks)**

b. State and explain uniqueness theorem. **(05 Marks)**

c. Given vector field $\overline{E} = (12yx^2 - 6z^2x)\hat{a}_x + (4x^3 + 18zy^2)\hat{a}_y + (6y^3 - 6zx^2)\hat{a}_z$. Check for Laplace or Poisson's field. **(05 Marks)**

OR

6 a. State Biot-Savart's law, Ampere's circuital law and Stoke's theorem. **(06 Marks)**

b. A single turn circular coil of 50 meter in diameter carries a current of 28×10^4 Amps. Determine the magnetic field intensity $\overline{H}$ at a point on the axis of coil and 100 m from the coil. The μ_r of the free space is unity. **(05 Marks)**

c. Verify whether the vector field $\overline{F} = y^2z\hat{a}_x + z^2x\hat{a}_y + x^2y\hat{a}_z$ is irrotational or solenoidal. **(05 Marks)**

Module-4

7 a. Obtain the expression of Energy stored in a magnetic field. **(05 Marks)**

b. Derive Lorentz force equation and mention the applications of its solution. **(06 Marks)**

c. Derive the boundary conditions at the boundary between two magnetic media of different permeabilities. **(05 Marks)**

OR

8 a. Derive the expression for the inductance of a solenoid. **(05 Marks)**

b. Calculate the inductance of a 10 m long co-axial cable filled with a material for which $\epsilon_r = 18$, $\sigma = 0$, $\mu_r = 80$. The external and internal diameters of the cable are 1 mm and 4 mm respectively. **(06 Marks)**

c. Find the maximum torque on an 85 turn rectangular coil 0.2m by 0.3m carrying a current 2A in a field B = 6.5 J. **(05 Marks)**

Module-5

9 a. State and explain Poynting theorem with derivation. **(08 Marks)**

b. Determine the propagation constant at 500 kHz for a medium in which $\mu_r = 1$, $\epsilon_r = 15$, $\sigma = 0$. At what velocity will an electromagnetic wave travel in this medium? **(08 Marks)**

OR

10 a. A uniform plane wave $E_y = 10\sin(2\pi10^8t - \beta x)$ is travelling in x-direction in free space. Find the phase constant, phase velocity and the expression for H_z. Assume $E_z = 0 = H_y$. **(08 Marks)**

b. Explain skin depth and skin effect. Derive an expression for skin depth. **(08 Marks)**

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10EE44

Fourth Semester B.E. Degree Examination, June/July 2018
Field Theory

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. State and explain coulombs' law in vector form. **(06 Marks)**

b. Derive an expression for Gauss law in differential form. **(08 Marks)**

c. A zone point charge in located at P(2, 4, -3). Find : i) E(r) ii) Find the locus of all points at which E(x) = 1V/mt. **(06 Marks)**

2 a. Show that Electric Field Intensity is equal to negative gradient of potential in an electrostatic field. **(10 Marks)**

b. A spherical surface in free space, r = 4cm contains a uniform surface charge density of 20micro coulombs/m^2. Find r_A if the region $0.06 < r < r_A$. Contains 1 milli Joule of Energy. **(10 Marks)**

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

b. Derive Laplace equation from Maxwell's first equation of electrostatics. **(06 Marks)**

c. Solve Laplace's equation between two conical surfaces. **(06 Marks)**

4 a. Compute the magnetic field at a point on the axis of a square loop of wire carrying a current of 'I' amperes of a side 'a' mts, **(10 Marks)**

b. If $\overline{A} = 10P^{1.5}\overline{a}_z$ wb/mt in free space find i) $\overline{H}$ ii) $\overline{J}$. **(10 Marks)**

PART – B

5 a. Explain phenomena of Magnetization and permeability in magnetic materials and show that $\mu_r = 1 + x_m$. **(10 Marks)**

b. A square loop in z = 0 plane in carrying 2 milli amperes in the field of an infinite filament on the y-axis carrying a current of 15Amps. Determine the total force on the loop. **(06 Marks)**

c. Derive an expression for self inductance of a Torroid. **(04 Marks)**

6 a. Write down the Maxwell's Equation in differential scalar form. **(08 Marks)**

b. Show that in a capacitor, conduction current is equal to displacement current. **(06 Marks)**

c. Explain briefly the concept of related potentials in time varying fields. **(06 Marks)**

7 a. Derive expression for attenuation constant and phase constant of Electromagnetic wave in a conducting medium. **(10 Marks)**

b. State and prove poynting vector theorem. **(10 Marks)**

8 a. Discuss clearly reflection and refraction of electromagnetic waves. **(06 Marks)**

b. Define the terms i) Reflection co-efficient ii) Transmission co-efficient with respect to reflections of electromagnetic waves. **(04 Marks)**

c. Given region 1, $z < 0$, $\epsilon_1 = 20$pF/mt , $\mu_1 = 2$ μH/mt ; region 2, $0 < z < 8$cm, $\epsilon_2 = 50$pF/mt , $\mu_2 = 2.5$μH/mt and region 3, $z > 8$cm, $\epsilon_3 = \epsilon_1$ and $\mu_3 = \mu_1$; let $\sigma = 0$ everywhere i) what is the lowest frequency at which a uniform plane wave incident from region 1 on the boundary at z = 0 will have no reflection? i) If f = 200MHz what will be SWR in region 1? **(10 Marks)**

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10EE45

Fourth Semester B.E. Degree Examination, June/July 2018

Power Electronics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With a block diagram, explain the working of a power electronic converter with the help of a controller. **(06 Marks)**

b. Explain the control characteristics of (i) SCR (ii) GTO (iii) MCT (iv) MOSFET (v) SITH. Draw symbol, input, control signal and output waveforms for each device. **(10 Marks)**

c. With neat diagram, explain the working of thyristorized tap changers. **(04 Marks)**

2 a. Explain the need of base drive control with diagram. Explain proportional drive control of BJT. **(06 Marks)**

b. For the transistor switch of Fig.Q2(b), β varies between 8 and 40. Calculate:
i) The value of R_B that drives the device into saturation with ODF = 5
ii) Forced β_f
iii) Total power loss in the device.

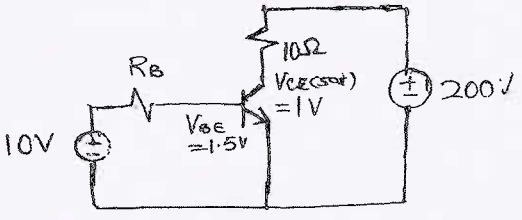

Fig.Q2(b) **(08 Marks)**

c. What is dv/dt and di/dt? Explain how to protect the device against dv/dt and di/dt. **(06 Marks)**

3 a. Why SCR is called as a semicontrolled device? Define latching current and holding current of a SCR. **(06 Marks)**

b. A SCR has a di/dt = 120 A/μs and du/dt = 300 V/μs. It operates on a dc voltage of 250 V. Calculate the value of components of protection circuit. **(06 Marks)**

c. Derive an expression for an equalizing resistance 'R' to be connected across each SCR of a series connected SCRs to share equal voltages under steady state conditions. **(08 Marks)**

4 a. What is commutation? Distinguish between natural commutation and forced commutation. **(06 Marks)**

b. With a neat diagram and waveform, explain the working of auxiliary voltage commutation. **(08 Marks)**

c. A complimentary commutation circuit operates from a dc source of 120 V and uses $R_1 = R_2 = 10\ \Omega$, commutating capacitor C = 10 μF. Calculate: (i) Circuit turn off time (ii) Peak thyristor current. **(06 Marks)**

PART – B

5 a. With a circuit diagram, explain the working of a 1-ϕ full converter with R-load. Derive an expression for average and rms output voltage. Draw waveforms showing output voltage, output current, current through SCR and diode. **(12 Marks)**

b. A 1-ϕ semiconverter is operated from 120V, 50Hz ac supply. The load resistance is 10Ω. If the average output voltage is 25% of the maximum possible average output voltage. Determine: (i) Firing angle (ii) rms and average output current (iii) rms and average thyristor current. **(08 Marks)**

6 a. Explain the principle of operation of step-up chopper with resistive load. Derive the expression for average output voltage. Draw relevant waveforms. **(07 Marks)**

b. Explain different control strategies used for choppers. Draw relevant waveforms. **(06 Marks)**

c. A chopper is operated on TRC at a frequency of 2 kHz. The supply voltage is 460 V and the load voltage is 350 V. Calculate the conduction and non conduction period of the thyristor in each cycle. **(07 Marks)**

7 a. With neat circuit, waveforms showing conduction intervals, sequence of device conduction and equivalent circuit, explain the working of 3-ϕ inverter for 180° conduction. Also show the line voltage V_{RY} and phase voltage V_{RN}. **(10 Marks)**

b. A 1-ϕ bridge inverter has a resistive load of 10Ω and the dc input voltage is V_s = 220 V. Calculate:

i) The rms output voltage at fundamental frequency
ii) The average, rms and peak currents of each thyristor
iii) The output power **(05 Marks)**

c. With neat circuit diagram, explain the working thyristorized current source inverter. **(05 Marks)**

8 a. With a neat diagram and relevant waveforms, explain the principle of operation of bidirectional controllers with RL load. Derive an expression for rms value of output voltage. **(08 Marks)**

b. In an ON-OFF control circuit using 1-ϕ, 230 V, 50 Hz supply the ON time is 10 cycles and OFF time is 4 cycles. Calculate the rms value of the output voltage. **(04 Marks)**

c. Explain the effects of power electronic converter and remedial measures adopted. **(08 Marks)**

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CBCS SCHEME

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15EE46

Fourth Semester B.E. Degree Examination, June/July 2018
Operational Amplifiers and Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Discuss the Ideal characteristics of an OPAMP. **(04 Marks)**

b. Show that the output of subtractor is proportional to the different between the two input voltages. **(06 Marks)**

c. Draw and explain the operation of peaking amplifier. **(06 Marks)**

OR

2 a. For a non inverting amplifier, the values of R_1 and R_f are 1KΩ and 10KΩ respectively. The various op-amp parameters are, open loop gain is 2×10^5, input resistance is 2MΩ, output resistance is 75Ω, single break frequency is 5Hz, supply voltage are ± 12V. Calculate the closed loop gain, Input Resistance, output Resistance and Bandwidth with feedback. **(08 Marks)**

b. What is an Instrumentation amplifier? For instrumentation amplifier using transducer bridge, obtain the expression for output voltage V_0 in terms of change in Resistance ΔR of the transducer. Draw the circuit diagram. **(08 Marks)**

Module-2

3 a. Derive the expression for the phase shift produced by an All pass Filter. **(08 Marks)**

b. With a neat diagram, explain the operation of a voltage follower regulator using OPAMP. **(08 Marks)**

OR

4 a. Explain the following performance parameters of voltage Regulator.
(i) Line Regulation (ii) Load Regulation (iii) Ripple Rejection. **(05 Marks)**

b. Design second order Low pass Filter for a cut-off frequency of 100Hz with capacitor selected as 0.1μF and draw the circuit diagram. **(05 Marks)**

c. Briefly explain with the help of schematic Diagram, the working of LM317 IC Regulator. **(06 Marks)**

Module-3

5 a. Draw and explain triangular wave generator using square wave generator and integrator method. Draw the required waveforms. **(10 Marks)**

b. With a neat circuit diagram and waveforms, explain the operation of inverting Schmitt trigger circuit with different LTP and UTP. **(06 Marks)**

OR

6 a. Using 741 OPAMP with a supply voltage of ± 12V, design a RC phase shift oscillator to have an output frequency of 3.5 KHz. Draw the circuit diagram. **(06 Marks)**

b. Draw and explain the operation of voltage to frequency converter using OPAMP. **(05 Marks)**

c. Design the wein bridge oscillator circuit to have output frequency of 10KHz. Use C = 0.01μF. **(05 Marks)**

Module-4

7 a. Design the precision full wave rectifier circuit to produce a 2V peak output from a sine wave input with a 0.5V peak value and 1MHz frequency. Use Bipolar OPAMPS with a supply voltage of ± 15V. Choose adequate diode current as 500μA. Draw the circuit diagram. **(06 Marks)**

b. Explain the successive approximation A/D converter technique with the help of block diagram. **(05 Marks)**

c. Sketch and explain the working of sample and Hold circuit. **(05 Marks)**

OR

8 a. With a neat circuit diagram, explain the operation of a high input impedance full wave precision rectifier. Draw the voltage waveforms at various points in the circuit and write the appropriate equations to show that full wave ratification is performed. **(08 Marks)**

b. Explain the working of Dual slope ADC with the help of neat diagram. **(08 Marks)**

Module-5

9 a. Draw and explain the functional block diagram of IC 555. **(08 Marks)**

b. Explain PLL IC 565 application as frequency multiplier and frequency synthesizer. **(08 Marks)**

OR

10 a. Design an Astable multivibrator having an output frequency of 10KHz with a duty cycle of 25%, using IC 555. Use C = 0.01μF. **(08 Marks)**

b. What is phase locked loop? Explain the working of the building blocks of PLL. **(08 Marks)**

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