(17)

CBCS SCHEME

USN | | | | | | | | | | |

18EE32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define :
i) Linear and non linear circuit
ii) Active and passive circuit
iii) Unilateral and bilateral circuit. **(06 Marks)**

b. For the circuit shown in Fig.Q1(b) determine resistance between M and N using star/delta transformation.

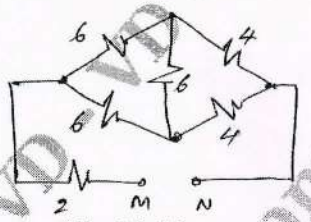


Fig.Q1(b) **(06 Marks)**

c. Use node voltage analysis to find node voltages in the network shown in Fig.Q1(c).

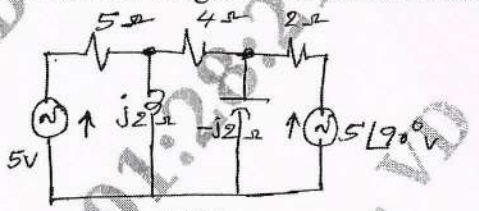


Fig.Q1(c) **(08 Marks)**

OR

2 a. Derive an expression for converting Delta to Star. **(06 Marks)**

b. Determine potential difference between M and N using source transformation of circuit shown in Fig.Q2(b).

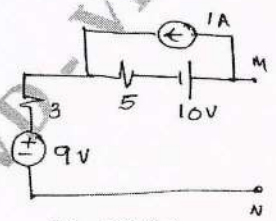


Fig.Q2(b) **(06 Marks)**

c. Use Mesh current analysis to find the current flowing in 30Ω resistor of circuit shown in Fig.Q2(c).

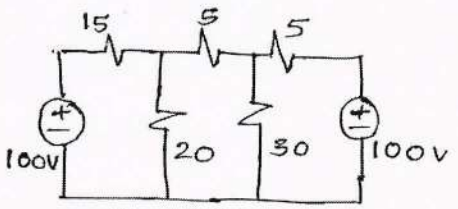


Fig.Q2(c) **(08 Marks)**

Module-2

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

b. For the circuit shown in Fig.Q3(b) find 'I_X' using super position theorem.

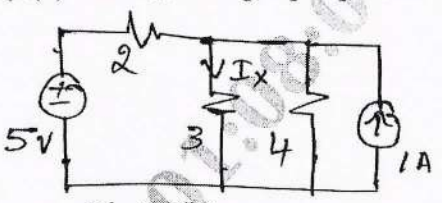


Fig.Q3(b) **(07 Marks)**

c. Use Milliman's theorem to find current in the circuit shown in Fig.Q3(c).

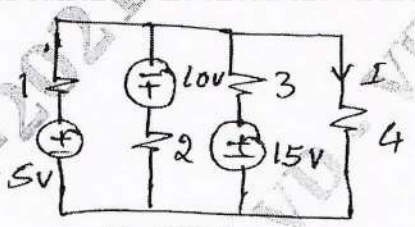


Fig.Q3(c) **(07 Marks)**

OR

4 a. State and obtain condition for maximum power when load impedance is equal to pure variable resistance. **(06 Marks)**

b. For the network shown in Fig.Q4(b), find current 'I' using Norton's theorem.

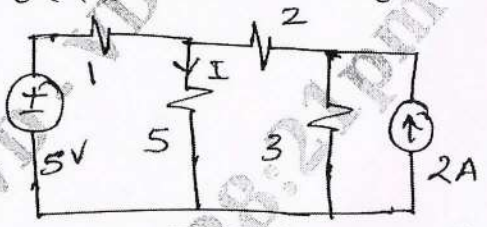


Fig.Q4(b) **(07 Marks)**

c. For the network shown in Fig.Q4(c). Draw Thevenin's equivalent circuit.

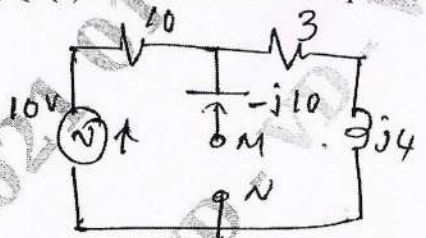


Fig.Q4(c) **(07 Marks)**

Module-3

5 a. Show that resonant frequency is the geometric mean of cut-off frequencies. **(07 Marks)**

b. A series RLC circuit has a resistance of 100Ω, an inductance of 0.5H and capacitance of 0.4μF. Find the resonant frequency, half power frequencies, band width and quality factor. **(07 Marks)**

c. For the circuit shown in Fig.Q5(c), find the value of inductance take w = 500r/s.

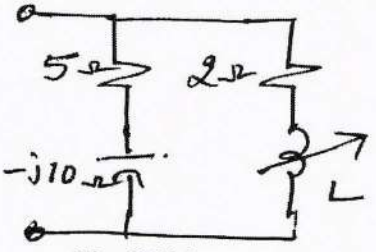


Fig.Q5(c) **(06 Marks)**

OR

6 a. Explain the behavior of R, L and C for initial condition. **(07 Marks)**

b. For the network shown in Fig.Q6(b) switch is closed at t = 0. Determine current and its first and second derivative at $t = 0^+$.

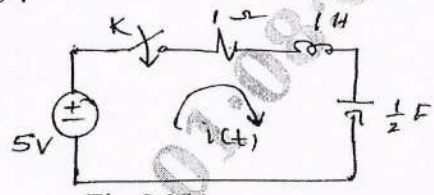


Fig.Q6(b) **(07 Marks)**

c. For the R – L circuit shown in Fig.Q6(c). Obtain the expression for current i(t) for $t \geq 0$.

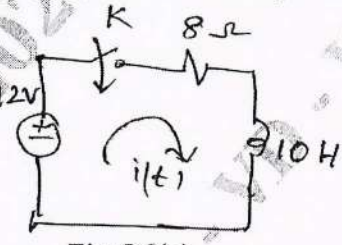


Fig.Q6(c) **(06 Marks)**

Module-4

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

b. Find the inverse Laplace transform of

$$V(s) = \frac{10}{s(s+1)(s+2)}.$$ **(07 Marks)**

c. For the network shown in Fig.Q7(c), draw the transformed circuit and obtain the expression for current i(t) for $t \geq 0$.

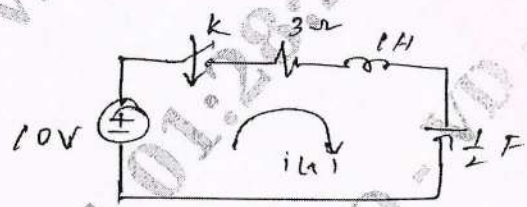


Fig.Q7(c) **(07 Marks)**

OR

8 a. Find the ILT of : i) step signal ii) Ramp iii) impulse signal. **(06 Marks)**

b. For the waveform shown in Fig.Q8(b) obtain the Laplace transform.

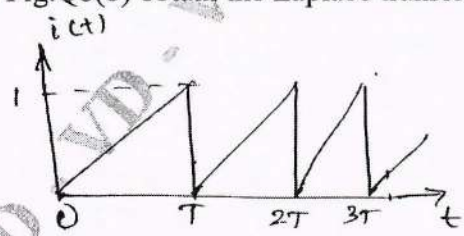


Fig.Q8(b) **(08 Marks)**

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

i) $V_1(s) = \frac{s^2 + 3s + 2}{s^3 + 3s^2 + 3s + 1}$

ii) $V_2(s) = \frac{10}{s(s+3)}$. **(06 Marks)**

Module-5

9 a. A 3 phase supply with line voltage of 250V has a unbalanced Delta connected load as shown in Fig.Q9(a). Determine line currents, active and reactive power for phase sequence A B C.

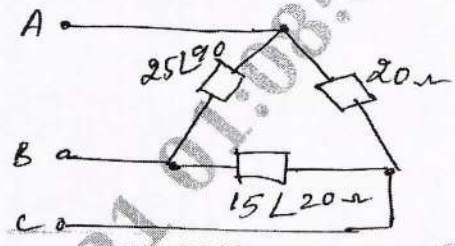


Fig.Q9(a) **(10 Marks)**

b. An unbalanced 4 wire star connected load has a balanced supply of 400V. For the phase sequence ABC, calculate the line currents and total power of the circuit shown in Fig.Q9(b).

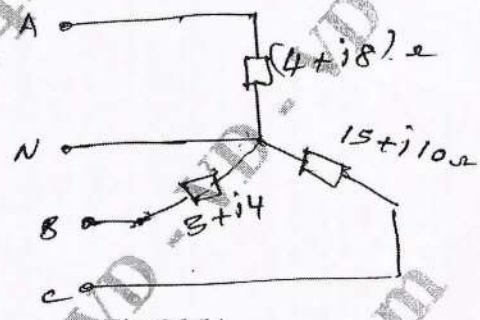


Fig.Q9(b) **(10 Marks)**

OR

10 a. Obtain the Impedance parameters interms of Admittance parameters. **(10 Marks)**

b. For the network shown in Fig.Q10(b) determine z-parameters.

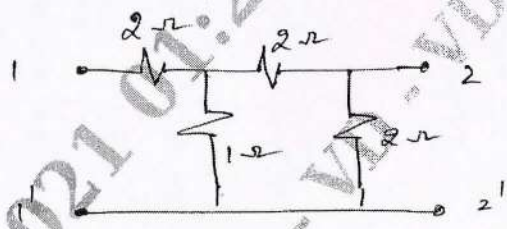


Fig.Q10(b) **(10 Marks)**

* * * * *

CBCS SCHEME

3

USN | | | | | | | | | | |

18EE33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain practical transformer on no-load. **(04 Marks)**

b. With the help of a neat circuit diagram and phasor diagram. Explain the operation of a 3-phase star-Delta transformer. **(06 Marks)**

c. Draw the phasor diagram of a transformer supplying Lagging power factor load. **(04 Marks)**

d. A 230/460V single phase transformer has a primary resistance of 0.2 ohm and a reactance of 0.5ohm and the corresponding values for the secondary are 0.75 ohm and 1.8 ohm respectively. Find the secondary terminal voltage when supplying 10A at 0.8 power factor lagging. **(06 Marks)**

OR

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

b. Explain with circuit diagram and phasor diagram how two transformers connected in open delta can supply the power successfully. **(06 Marks)**

c. Find the all day efficiency of a transformer having maximum efficiency of 98% at 15kVA at unity power factor and loaded an follows :
12Hr 2kW at 0.5 power factor
6 Hr 12kW at 0.8 power factor
6 Hr No load. **(06 Marks)**

Module-2

3 a. With a neat circuit, explain how iron losses can be separated into hysteresis and eddy current losses in a transformer. **(08 Marks)**

b. List the conditions to be satisfied for parallel operation of single phase and Three phase transformers. **(04 Marks)**

c. Two 250kVA transformers supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are same. The resistance drops are 1.5% and 0.9% and reactance drops are 3.33% and 4% respectively. Calculate the KVA loading on each transformer and its power factor. When the total load on the transformers is 500KVA at 0.707 lagging power factor. **(08 Marks)**

OR

4 a. Obtain the expression for current shared by two transformers with unequal voltage ratios connected in parallel. The transformers have unequal internal impedance. Also draw the phasor diagram. **(08 Marks)**

b. In a 400V, 50Hz transformer, the total iron loss is 2500W. When the supply voltage and frequency reduced to 200V, 25Hz respectively the corresponding loss is 850W. Calculate the eddy current loss at normal voltage and frequency. **(06 Marks)**

c. An auto transformer supplies a load of 3kW at 115V, unity power factor. If the applied voltage is 230V, calculate the power transferred to the load i) inductively ii) conductively. **(06 Marks)**

Module-3

5 a. What is Cooling of transformer? List different methods of cooling and explain any two of them. **(06 Marks)**

b. An 8 pole wave wound DC generator has 480 armature conductors. The armature current is 200A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole, if the brushes are shifted 6° electrical from Geometrical natural axis. **(06 Marks)**

c. Define: i) Distribution factor ii) Pitch factor. Derive the expressions for the factors. **(08 Marks)**

OR

6 a. Define Armature reaction in a DC generator. What are the effects of armature reaction? Explain. **(06 Marks)**

b. With necessary diagrams, explain armature reaction in alternator for lagging, unity and leading power factors. **(06 Marks)**

c. A 3 phase, 8 pole, star connected alternator has the armature coils short chorded by 1 slot. The coil span is 165° electrical. The alternator is driven at the speed of 750rpm. If there are 12 conductors per slot, and flux per pole is 50wmb, calculate the value of the induced emf across the terminals. **(08 Marks)**

Module-4

7 a. Define voltage regulation of the alternator and explain the Ampere turn method of predetermination of regulation. **(08 Marks)**

b. Define Short Circuit Ratio (SCR). Explain its significance. **(04 Marks)**

c. A 3 phase 2000KVA star connected 50Hz, 2300V alternator has a resistance between each pair of terminals as measured by direct current is 0.16ohm. The alternator gave a short circuit current of 600A for a excitation. With same excitation the open circuit voltage is 900V (line). Determine the full load regulation at i) unity power factor ii) 0.8pf lagging. **(08 Marks)**

OR

8 a. Explain the zero power factor method of predetermination of regulation of an alternator. **(08 Marks)**

b. Compare synchronous Impedance method and Ampere turn method of predetermining of regulation. **(04 Marks)**

c. A 3.5MVA, star connected alternator at 4160V at 50Hz has an pen circuit characteristics as given by the following data :

I_f, Amp	50	100	150	200	250	300	350
V_{oc}. Volts (Line)	1629	3150	4160	4750	5130	5370	5550

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

Module-5

9 a. What is synchronization? Explain with the help of a neat sketch. The three lamps dark method of synchronization. **(08 Marks)**

b. Derive an expression for the power angle characteristics of cylindrical rotor alternator. Sketch the power angle curve. **(06 Marks)**

c. An alternator has a direct axis synchronous reactance of 0.7pu and a quadrature axis synchronous reactance of 0.4pu. It is used to supply full load at rated voltage at 0.8pf. Find the induced emf on open circuit. **(06 Marks)**

OR

10 a. With the help of a circuit diagram, explain the measurement of direct axis and quadrature axis reactances by slip test. **(08 Marks)**

b. Draw and explain the capability curve of synchronous generator. **(06 Marks)**

c. What is hunting in synchronous machines? How do you eliminate hunting? **(06 Marks)**

CBCS SCHEME

USN | 2 | V | D | 2 | 0 | E | E | 4 | 0 | 8 |

18EE34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What is bias stabilization? Explain with help of load line the effect of variation of V_{CC}, I_B, on Q-point of a transistor. **(10 Marks)**

b. For the emitter bias network shown in Fig Q1(b)

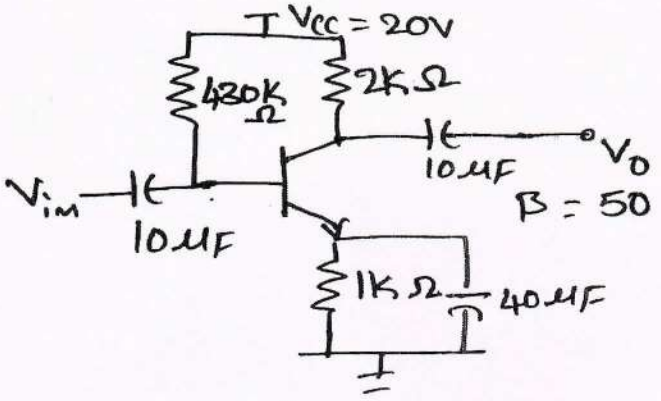


Fig Q1(b)

Determine following : i) I_B ii) I_C iii) V_{CE} iv) V_C v) V_E. **(10 Marks)**

OR

2 a. With circuit diagram and explain the voltage divider Biasing circuit. Also derive the I_B and V_{CE}. **(10 Marks)**

b. Draw and explain the double ended diode clipper circuit. **(05 Marks)**

c. Draw a simple +ve damper circuit and explain its operation. **(05 Marks)**

Module-2

3 a. State and prove miller's theorem. **(06 Marks)**

b. Compare the characteristics of CE, CC, CB configuration. **(04 Marks)**

c. Derive the expression for A_V, Z_i and Z_o of the voltage divider bias circuit using hybrid model. **(10 Marks)**

OR

4 a. Starting from the fundamentals, define h-parameters and obtain h-parameter equivalent circuit of common emitter configuration. **(10 Marks)**

b. Transistor used in RC coupled CE amplifiers with fixed bias has $h_{ie} = 1k\Omega$, $h_{fe} = 60$, $h_{ve} = 15\mu A/V$, $h_{re} = 2 \times 10^{-4}$, circuit has $R_s = 1k\Omega$, $R_B = 56k\Omega$, $R_C = 10k\Omega$ and $R_L = 10k\Omega$. Find A_I, A_{IS}, Z_{in} and Z_o. **(10 Marks)**

Module-3

5 a. Explain the operation of cascade connections with the help of neat diagram. **(10 Marks)**

b. Draw the circuit of Darlington emitter follower with voltage divider bias calculate input impedance, voltage gain and output impedance. Take $\beta_1 = \beta_2 = 100$, $R_1 = R_2 = 100k\Omega$, $R_E = 5k\Omega$, Take $r_e = 0.1k\Omega$. **(10 Marks)**

OR

6 a. What are the advantages of negative feedback in amplifiers? **(06 Marks)**

b. Draw the block diagram and explain the concept of feedback. **(04 Marks)**

c. Derive an expression for Z_i and A_i for a Darlington emitter follower circuits. **(10 Marks)**

Module-4

7 a. With a neat diagram, explain the different types of power amplifiers. **(10 Marks)**

b. With a circuit diagram, explain the transformer coupled class A amplifier. Also derive the expression R_L'. **(10 Marks)**

OR

8 a. With a neat diagram, explain the wein bridge oscillator circuits. **(10 Marks)**

b. In a Hartley oscillator $L_1 = 20\mu H$, $L_2 = 2mH$ and C is variable. Find the range of C if frequency is to be varied from 1MHz to 2.5MHz. Neglect mutual inductance. **(08 Marks)**

c. Comparison between RC phase shift and wein bridge oscillator. **(02 Marks)**

Module-5

9 a. With a neat diagram, explain the construction of n-channel JFET. **(10 Marks)**

b. Derive an expression for saturation drain current of n-channel JFET. **(10 Marks)**

OR

10 a. Mention the different between BJT and FET. **(06 Marks)**

b. A JFET has $g_m = 6mV$ at $V_{GS} = -1V$. Find I_{DSS} if pinch-off voltage $V_P = -2.5V$. **(04 Marks)**

c. Explain construction, working and characteristics of n-channel depletion type MOSFET. **(10 Marks)**

* * * * *

5

CBCS SCHEME

USN | | | | | | | | | | |

18EE35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Digital System Design

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define combinational logic. List the various steps in designing the combinational logic circuit and explain with a block diagram. **(06 Marks)**

b. Explain the canonical minterm and maxterm form with examples. **(04 Marks)**

c. Simplify the Boolean function using K-map following as
$P = f(a, b, c, d) = \Sigma m(2, 3, 4, 5, 13, 15) + \Sigma d(8, 9, 10, 11)$
$Q = f(w, x, y, z) = \pi(1, 4, 5, 11, 12, 13, 14, 15) \cdot d(3, 9, 10)$. **(10 Marks)**

OR

2 a. Using K-map method, obtain a minimal SOP expression and implement the function using NAND gates.
$x = f(a, b, c, d, e) = \Sigma m(1, 3, 4, 6, 9, 11, 12, 14, 17, 19, 20, 22, 25, 27, 28, 30)$. **(08 Marks)**

b. Simplify using Quire – McCluskey method and realize the function using a basic gates.
$M = f(a, b, c, d) = \Sigma m(7, 9, 12, 13, 14, 15) + \Sigma d(4, 11)$. **(12 Marks)**

Module-2

3 a. Design a combinational logic circuit that will convert BCD digit to Excess-3 BCD digit using gates. Construct a truth table and simplify each output equation using K-maps. **(08 Marks)**

b. Design a binary full adder using only 2-input NAND gates. Construct a truth table and write a Boolean expression for SUM and CARRY. **(07 Marks)**

c. Design a 4 to 16 line decoder by cascading 2 to 4 line decoders which has the active low output and active low enable input. **(05 Marks)**

OR

4 a. Realize the following Boolean function using 8 : 1 MUX with 'wyz' as select inputs.
$V = f(w, x, y, z) = \Sigma m(0, 1, 2, 5, 7, 8, 9, 12, 13)$. **(05 Marks)**

b. Implement 4 bit parallel adder/subtract using 4-full adders blocks. Explain its operation if $C_{in} = 0$ the circuit should act as adder and if $C_{in} = 1$ the circuit act as subtractor. **(05 Marks)**

c. Design a two-bit magnitude comparator with help of the truth table and simplification of the output equations using K-maps. Draw a logic diagram. **(10 Marks)**

Module-3

5 a. Explain the operation of SR Latch act as switch debouncer with help of the timing diagram. **(05 Marks)**

b. Explain the working of a Master-slave JK flip-flop with a neat logic diagram, function table, logic symbol and timing diagram. **(10 Marks)**

c. Obtain the characteristic equation of the JK and D flip-flops. **(05 Marks)**

OR

6 a. Differentiate the sequential logic circuit and combinational logic circuit. **(04 Marks)**

b. Explain the operation of SR latch with a neat logic diagram and timing diagram. **(06 Marks)**

c. Draw a neat diagram and explain the working of positive edge-trigger D-flipflop with function table, logic symbol and timing diagram. **(10 Marks)**

Module-4

7 a. Explain the working of 4-bit binary ripple counter using a positive edge trigger T-flip-flop with an enable line and relevant timing diagram. **(08 Marks)**

b. Design a mod-8 twisted ring counter and explain its operation. Write the count sequence table. **(07 Marks)**

c. With a neat logic diagram, explain the operation of the 4-bit SISO unidirectional shift register. **(05 Marks)**

OR

8 a. Design a synchronous counter with counting sequence. 3, 2, 5, 1, 0, 3 . . . . using D-flip-flips. **(10 Marks)**

b. With a neat logic diagram, explain the 4-bit universal shift register using D-flip-flops and a 4 : 1 MUX. Write a mode control and register operation. **(10 Marks)**

Module-5

9 a. With a suitable block diagram, explain the Mealy and Moore model in a sequential circuit analysis. **(08 Marks)**

b. Construct a sequential logic circuit with single input(x) and single output(z) by obtaining the state and excitation tables for the given state diagram as shown in Fig.Q9(b), using JK flip-flops.

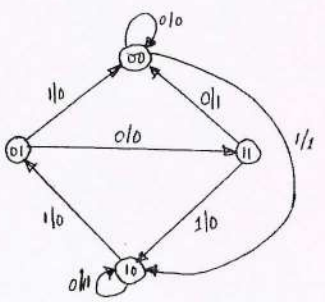


Fig.9(b) **(12 Marks)**

OR

10 a. Differentiate a Mealy and Moore models. **(04 Marks)**

b. Explain the following terms : i) ROM ii) PROM iii) Flash memory with a suitable diagram. **(06 Marks)**

c. Analyze the following sequential logic circuit as shown in Fig.Q10(c). Obtain the excitation and output equation, transition table and state table. Also draw a state diagram.

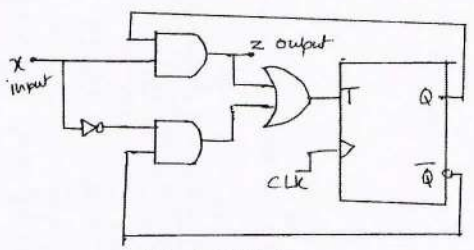


Fig.Q10(c) **(10 Marks)**

* * * * *

CBCS SCHEME

6

USN | | | | | | | | | | |

18EE36

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Electrical and Electronic Measurements

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the principle of operation of Kelvin's double bridge. Also mention its applications. **(06 Marks)**

b. A high sensitive galvanometer can detect a current as low as 0.1nA. This galvanometer is used in a Whetastone's bridge as a detector. Each arm of the bridge has a resistance of 1kΩ. The input voltage applied to the bridge is 20V. Calculate the small change in resistance which can be detected. The resistance of the galvanometer can be neglected as compared with the internal resistance of the bridge. **(06 Marks)**

c. Mention the factors on which earth resistance depends. Explain the fall of potential method used for the measurement of earth resistance. **(08 Marks)**

OR

2 a. A Maxwell's Inductance comparison bridge is as shown in Fig Q2(a). Arm ab consists of a coil with inductance L_1 and resistance r_1 in series with a non inductive R_1. Arm bc and cd are each a non-inductive resistance of 100Ω. Arm ad consists of standard variable inductor L of resistance 32.7Ω. Balance is obtained when L = 47.8mH and R = 1.36Ω. Find the Resistance and inductance of coil in arm ab.

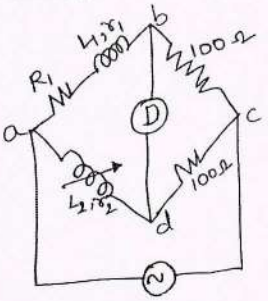


Fig Q2(a) **(06 Marks)**

b. The four arms of a bridge are :
Arm ab : an imperfect capacitor C_1 with an equivalent series resistance of r_1 ;
Arm bc : an non-inductive resistance R3 ;
Arm da : an imperfect capacitor C_2 with an equivalent resistance of r_2 in series with a resistance R_2.
A supply of 450Hz is given between terminal a and c, and $R_2 = 4.8\Omega$, $R_3 = 2000\Omega$, $R_4 = 2850\Omega$ and $C_2 = 0.5\mu f$ and $r_2 = 0.4\Omega$. The detector is connected between b and d. Calculate the value of C_1 and r_1 and also of the dissipating factor for this capacitor. **(08 Marks)**

c. With neat circuit diagram, explain the operation of modified Desautys bridge. Derive balanced equation and also draw phasor diagram under balanced condition. **(06 Marks)**

Module-2

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

b. What is phase sequence indicator? Explain static type with relevant circuit diagram. **(06 Marks)**

c. In a particular test the two wattmeter readings are 4kW and 1kW. Calculate the power and power factor if i) Both meters read direct ii) One meter connections reversed. **(04 Marks)**

d. What are creeping errors in an energymeter? What are its possible causes? How can it be compensated in an induction type energy meter? **(04 Marks)**

OR

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

b. A single phase energymeter has a constant of 1500 revolutions/kwh. If 8 lamps of 100w, 6 fans of 60w and 2 heaters of 1000w operate for one hour, the disc makes 4500 revolutions. Find out whether the meter reads correctly. If not find the percentage error. **(06 Marks)**

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

Module-3

5 a. What is multiplier resistor? How it is used to extend the range of a voltmeter? Discuss about different way of designing multi-range voltmeter. **(08 Marks)**

b. A 1mA meter D'Asonval movement with an internal resistance of 100Ω is to be converted into 0-100mA ammeter. Calculate shunt Resistance required. What will be the range of the ammeter if shunt resistance is doubled? **(06 Marks)**

c. Draw the equivalent circuit and rector diagram of a current transformer and hence write the expression for its ratio and phase angle error. **(06 Marks)**

OR

6 a. With a neat circuit diagram, explain measurement of magnetizing force using a search coil and a ballistic galvanometer. **(07 Marks)**

b. Explain the Silsbee's method of testing current transformer. **(07 Marks)**

c. What is turns compensation in instrument transformer? Why is it needed? **(06 Marks)**

Module-4

7 a. List out the advantages of electronic instruments over conventional analog meters. **(06 Marks)**

b. With the help of block diagram, explain true RMS reading voltmeter. **(08 Marks)**

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

OR

8 a. What are the operating and performance characteristics of a digital voltmeter? Explain integrating type digital voltmeter with a neat block diagram. **(10 Marks)**

b. Explain the working of Q-meter. Also explain the errors in the measurement of Q-factor of coil. **(10 Marks)**

Module-5

9 a. With suitable diagram, explain the construction and working of strip chart recorders. **(08 Marks)**

b. With a neat diagram, explain the operating principle of Electro Cardio Graph (ECG). **(06 Marks)**

c. What are important characteristics of Nixie tube display systems? Explain with necessary diagrams. **(06 Marks)**

OR

10 a. Explain why recorders are essential? With neat block diagram, explain XY-recorders. **(06 Marks)**

b. With necessary circuit diagrams, explain the basic operating principle of Light Emitting Diode (LED). List the advantages and disadvantages of LED display systems. **(07 Marks)**

c. With a neat schematic diagram, explain the construction and operation of Cathode-Ray Tube. **(07 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17EE32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define and distinguish the following network elements :
i) Active and passive elements
ii) Linear and nonlinear circuits
iii) Unilateral and Bilateral circuits
iv) Lumped and distributed elements. **(08 Marks)**

b. Reduce the network shown in Fig.Q1(b) to a single voltage source in series with a resistance using source transformations.

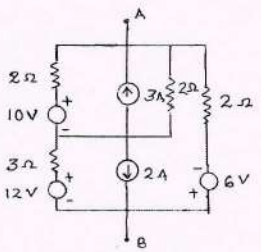


Fig.Q1(b) **(06 Marks)**

c. Derive an expression for Δ to Y transformations. **(06 Marks)**

OR

2 a. The network contains two voltage sources v_1 and v_2 as shown in Fig.Q2(a) with $v_1 = 30\angle 0°$ volts. Determine v_2, such that current in 2 + j3Ω impedance is zero. Use Mesh analysis.

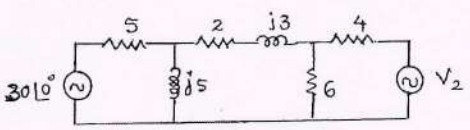


Fig.Q2(a) **(06 Marks)**

b. Determine v_1 and v_2 for the circuit shown in Fig.Q2(b) by using node analysis.

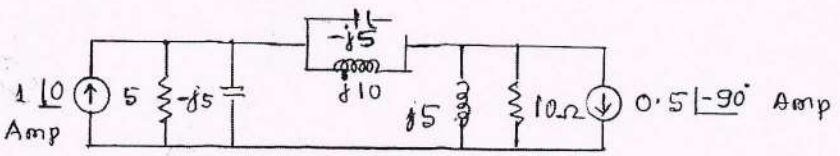


Fig.Q2(b) **(08 Marks)**

c. For the network shown in Fig.Q2(c), draw its dual network.

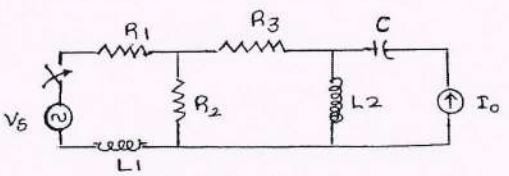


Fig.Q2(c) **(06 Marks)**

Module-2

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

b. In the circuit of Fig.Q3(b), use super position principle to determine the value of i_x.

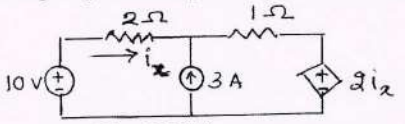


Fig.Q3(b) **(06 Marks)**

c. Find the current i_x and hence verify reciprocity theorem for the network in Fig.Q3(c).

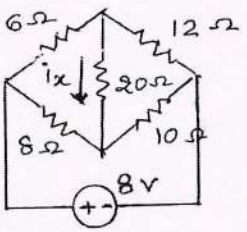


Fig.Q3(c) **(08 Marks)**

OR

4 a. State the Thevenin's theorem. **(06 Marks)**

b. For the network shown in Fig.Q4(b). Obtain the Thevenin's equivalent as seen from the terminals p and q.

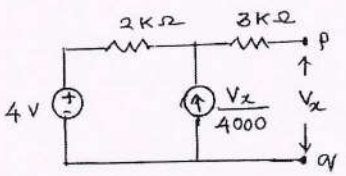


Fig.Q4(b) **(08 Marks)**

c. Find the Norton's equivalent for the circuit shown in Fig.Q4(c).

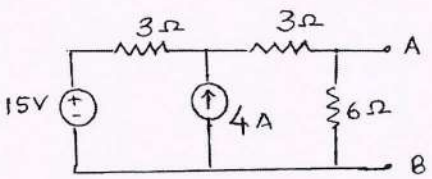


Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Define the following terms with reference to resonant circuit.

i) Resonance
ii) Q – factor
iii) Selectivity
iv) Bandwidth. **(08 Marks)**

b. Prove that $f_r = \sqrt{f_1 f_2}$, where f_1 and f_2 are the two half power frequencies of a resonant circuit. **(06 Marks)**

c. A resistor and a capacitor are in series with a variable inductor. When the circuit is connected to a 200V, 50Hz supply. The maximum current obtainable by varying the inductance is 0.314 Amp. The voltage across the capacitor is 300V. Find the circuit constants. **(06 Marks)**

OR

6 a. In the network of Fig.Q6(a), K is changed from position a to b at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0 +, if R = 1000Ω, L = 1H, c = 0.1μF and v = 100volts.

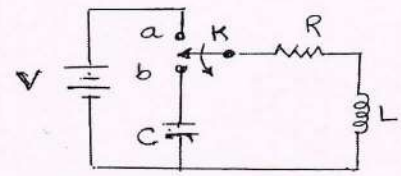


Fig.Q6(a) **(10 Marks)**

b. In the network shown in Fig.Q6(b), the switch K is opened at t = 0. At t = 0+, solve for the value of v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$, if I = 10 Amp, R = 1000Ω and c = 1μF.

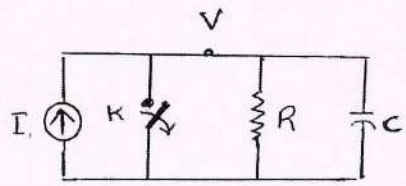


Fig.Q6(b) **(10 Marks)**

Module-4

7 a. Find the Laplace transform of the periodic wave form as shown in Fig.Q7(a).

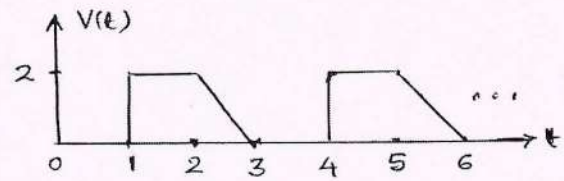


Fig.Q7(a) **(10 Marks)**

b. Find the Laplace transform of the periodic wave form as shown in Fig.Q7(b).

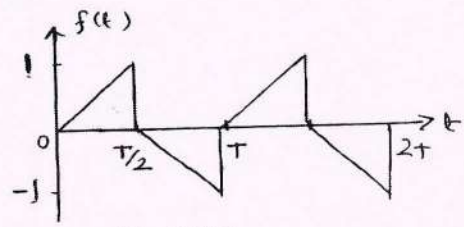


Fig.Q7(b) **(10 Marks)**

OR

8 a. State and prove :
i) Initial value theorem
ii) Final value theorem. **(10 Marks)**

b. Calculate i(0+) using initial value theorem, given that the transform function of the current $I(s) = \frac{2s+5}{(s+1)(s+2)}$. Determine i(t) and obtain its value at t = 2sec. **(10 Marks)**

Module-5

9 a. A three – phase, four wire, 208 volts ABC system supplies a star connected load in which $Z_A = 10\angle 0°$ ohms $Z_B = 15\angle 30°$ ohms and $Z_C = 10\angle -30°$ ohms. Find the line currents, the neutral current and the total power. **(12 Marks)**

b. Explain the method of analyzing 3-phase star connected load by using Milliman's theorem. **(08 Marks)**

OR

10 a. Obtain Z and Y parameters for the circuit shown in Fig.Q10(a).

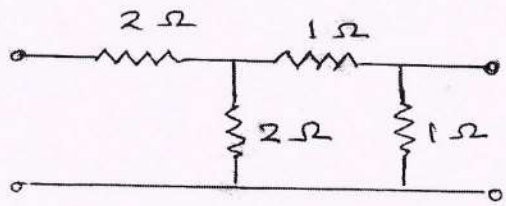


Fig.Q10(a) **(10 Marks)**

b. The following equations gives the relationship between the voltage and currents of a two-port network $I_1 = 0.25v_1 - 0.2v_2$, $I_2 = -0.2v_1 - 0.1v_2$. Obtain T–parameters. **(10 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17EE33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw and explain the full load phasor diagram of single phase transformer for lagging , leading and unity power factor loads. **(10 Marks)**

b. Prove that for maximum efficiency copper loss is equal to Iron loss. **(06 Marks)**

c. A 100 KVA, 6600/240 V, 50hz, single phase transformer takes 5A and 109W when 50V are applied in a short circuit test to the HV side and low voltage side shorted. Find the voltage to be applied to the HV side on full load at 0.8 power factor lagging when the secondary terminal voltage (LV) is 240V. **(04 Marks)**

OR

2 a. Explain SCOTT three phase/two phase connection with suitable circuit and phasor diagram. **(08 Marks)**

b. Explain with circuit diagram and phasor diagram, how two transformer connected in open delta can supply the power successfully. **(08 Marks)**

c. The primary and secondary winding of two transformers each rated 250 KVA, 11/2 KV and 50Hz are connected to open delta. Find i) The KVA load that can be supplied from this connection ii) Current on HV side if a delta connected 3ϕ load of 250KVA, 0.8 pf (lag) 2KV is connected to the LV side of the connection. **(04 Marks)**

Module-2

3 a. Discuss the necessary conditions for the parallel operation of 2 transformers. **(06 Marks)**

b. Derive an expression for the current shared by between 2 transformers connected in parallel supplying a common load when no load voltages of these transformer are equal. **(08 Marks)**

c. Two 1 phase transformer with equal turns have impedances of (0.5 + J3) ohms and (0.6 + j10) ohms with respect to the secondary. If they operate in parallel, how they will share total load of 100 kW at 0.8 lagging. **(06 Marks)**

OR

4 a. What is an Auto transformer? Describe its working and derive expression for saving of copper in an auto transformer as compared to an equivalent two winding transform. **(10 Marks)**

b. Explain the operation of on load tap changer. **(10 Marks)**

Module-3

5 a. Explain the necessity of terliary winding. **(06 Marks)**

b. What are the sources of noise in transformer? How to reduce the noise problem in transformer? **(08 Marks)**

c. A 4 pole lap wound dc shunt generator has flux per pole of 0.07 wb. The Armature winding consists of 220 turns, each turn having a resistance of 0.004Ω. Calculate the terminal voltage when running at 1000 rpm if the armature current is 60A. **(06 Marks)**

OR

6 a. Discuss the harmonics in transformers. **(06 Marks)**

b. Draw and explain the characteristics of DC shunt generator. **(08 Marks)**

c. Derive EMF equation of synchronous generator. **(06 Marks)**

Module-4

7 a. What is Synchronization of Alternators? What are the conditions for proper synchronization of alternators? Explain the method of synchronization of 3ϕ alternators. **(10 Marks)**

b. A 10 MVA 3 ϕ Alternator has an equivalent short circuit reactance 20%. Calculate the synchronizing power of the armature per mechanical degree of phase displacement when running in parallel on a 10,000 V, 50Hz bus bar at 1,500 rpm. **(07 Marks)**

c. Define Voltage regulation of alternator. **(03 Marks)**

OR

8 a. With the help of a neat phasor diagram, explain the concept of two reaction theory in a salient pole synchronous machine. **(10 Marks)**

b. Write a note on V – curve of synchronous generator. **(05 Marks)**

c. A synchronous generator has a direct axis synchronous reactance of 0.8 percent and a quadrature axis synchronous reactance of 0.5 per unit. It is supplying full load at rated voltage at 0.8 pf lagging. Find the open circuit voltage. **(05 Marks)**

Module-5

9 a. What do you mean by hunting in synchronous machine? Explain the role of damper winding. **(06 Marks)**

b. With a neat sketch, explain open circuit characteristic and short circuit characteristics of an alternator. **(06 Marks)**

c. Explain MMF method to find out regulation of an alternator. **(08 Marks)**

OR

10 a. A 600V, 60 KVA, single phase alternator has an effective resistance of 0.2Ω. A field current of 10A produces an armature current of 210A on short circuit and an emf of 480V on open circuit. Calculate i) Synchronous impedance and reactance.
ii) Regulation with 0.8 pf lagging, unity and 0.6 pf loading. **(06 Marks)**

b. Explain Potier Reactance method to determine Regulation. **(08 Marks)**

c. Write a note on Capability curves of Synchronous generator. **(06 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17EE34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. For the clipper limit shown in Fig Q1(a). Find V_0, sketch the V_0 waveform and also draw the transfer characteristics

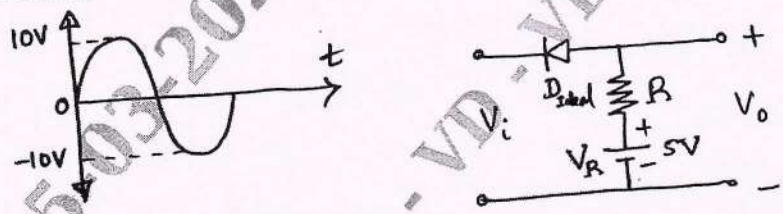


Fig Q1(a) **(07 Marks)**

b. With a neat circuit diagram, explain the operation fixed bias circuit. **(07 Marks)**

c. What is biasing of a transistor? Explain the requirements of biasing circuits. **(06 Marks)**

OR

2 a. Find the operating point for the voltage divider bias circuit with $\beta = 80$ and $V_{BE} = 0.6V$. Find the new operating point when β changes to 100 and V_{BE} changes to 0.25V. Consider, $V_{CC} = 15V$, $R_1 = 100K\Omega$, $R_2 = 18K\Omega$, $R_c = 4.7K\Omega$ and $R_E = 1K\Omega$. **(10 Marks)**

b. Obtain the expression for stability factor (S_{Ico}) for collector to base bias circuit. **(05 Marks)**

c. Explain the operation of a transistor as a switch. **(05 Marks)**

Module-2

3 a. Define h-parameters. Obtain the expression for current gain, voltage gain, input resistance and output resistance for CE configuration of BJT using h-parameters. **(10 Marks)**

b. For the emitter follower circuit shown in Fig Q3(b). Calculate z_i, z_o, A_v and A_i. Take the h-parameter of the transistor to be $h_{ie} = 1.1K\Omega$, $h_{re} = 2.5 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 24\ \mu A/v$

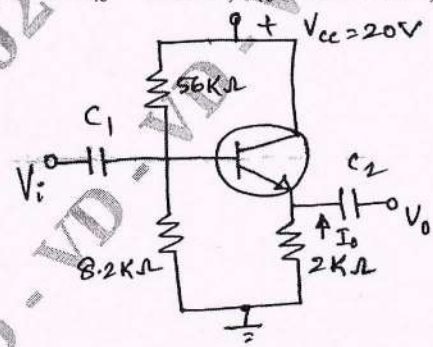


Fig Q3(b) **(06 Marks)**

c. A transistor in CE mode has h-parameters, $h_{ie} = 1100\Omega$, $h_{re} = 2.5 \times 10^{-4}$, $h_{fe} = 99$ and $h_{oe} = 25\mu A/v$. Determine equivalent CB parameters. **(04 Marks)**

OR

4 a. For the common base circuit shown in Fig Q4(a), the transistor parameters are $h_{ib} = 22\Omega$, $h_{rb} = 2.9\times10^{-4}$, $h_{fb} = -0.98$ and $h_{ob} = 0.49$ μA/v. Calculate the values of the input resistance, output resistance, current gain and voltage gain for the given circuit.

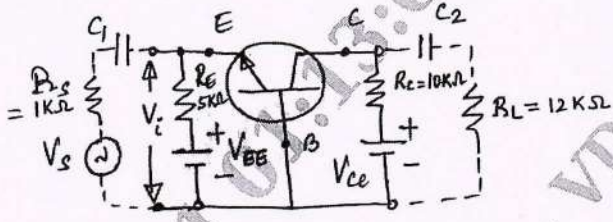


Fig Q4(a) **(10 Marks)**

b. State and prove Miller's theorem. **(10 Marks)**

Module-3

5 a. Explain the need for cascading amplifier. Draw and explain block diagram of n-stage cascaded amplifier. **(06 Marks)**

b. Compare the different types coupling methods used in multistage amplifiers. **(08 Marks)**

c. With the help of a neat circuit diagram, explain the working of a Darlington emitter follower. **(06 Marks)**

OR

6 a. Define Negative and Positive feedback. With the help of block diagram, explain the concept of feedback amplifier. **(07 Marks)**

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

c. An amplifier having a voltage gain of 60dB uses $1/20^{th}$ of it output in negative feedback. Calculate to the gain with feedback, the percentage change in gain without and with feedback consequent on 50% change in g_m (transfer or mutual conductance). **(05 Marks)**

Module-4

7 a. Explain the operation of a class-B push pull power amplifier. Prove that the maximum efficiency of a class – B configuration is 78.5%. **(10 Marks)**

b. State and explain Barkhausen criterion for sustained Oscillations. **(05 Marks)**

c. Explain the features of power amplifiers. **(05 Marks)**

OR

8 a. Draw the circuit of wein bridge oscillator and derive an expression for frequency of oscillator. **(10 Marks)**

b. Explain the operation of class A transformer coupled power amplifier and prove that the maximum efficiency is 50%. **(10 Marks)**

Module-5

9 a. Discus the construction, working and characteristics of an n-channel JFET. **(10 Marks)**

b. Give the comparison between the following :
i) BJT and FET ii) JFET and MOSFET iii) D-MOSFET and E-MOSFET. **(10 Marks)**

OR

10 a. Discuss the construction, working and characteristics of an enhancement type MOSFET [E-MOSFET]. **(10 Marks)**

b. With necessary equivalent circuit, obtain the expression for voltage gain, input impedance and output impedance of a Fixed biased common source – JFET amplifier. **(10 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17EE35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Digital System Design

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define the following terms with example :
i) Literal ii) Maxterm iii) Sumterm iii) Product of sum v) Canonical sum of products. **(05 Marks)**

b. Reduce the following function using K-map technique and implement using NAND gates only i) $f_1 (P, Q, R, S) = \sum m (0, 1, 4, 7, 8, 9, 10) + d (2, 11)$
ii) $f_2 (A, B, C, D) = \pi (0, 2, 4, 10, 11, 14, 15)$ **(10 Marks)**

c. Reduce the following function using K-map and implement using NOR gate only
$f_3 (A, B, C, D) = \sum m (0, 5, 7, 8, 10, 13) + d (2, 4, 14, 15)$ **(05 Marks)**

OR

2 Reduce the following function using Quine - McClusky method and shall all the tables including Reduced prime implicant table
$Q_1 = f (a, b, c, d, e) = \sum (1, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 26, 27)$ **(20 Marks)**

Module-2

3 a. Implement the following multiple output function using single 74LS138 (3 to 8 decoder) and external gates.
$F_1 (A, B, C) = \overline{A}B + A\overline{BC} + AC$
$F_2 (A, B, C) = \pi M (2, 3, 6, 7)$ **(04 Marks)**

b. Implement the following function
i) $f_1 (A, B, C, D) = \sum m (0, 2, 6, 10, 11, 12, 13) + d (3, 8, 14)$ using 74LS151 (8:1 MUX) considering Lower order inputs as select inputs.
ii) $f_2 (A, B, C, D) = \sum m (0, 2, 3, 4, 6, 7, 9, 11, 13, 15)$ using 74LS153 (4:1MUX) considering higher order inputs as select inputs. **(08 Marks)**

c. Develop the following combinational logic
i) Construct full subtracter using 74LS153
ii) Construct 4 to 16 decoder using 2 to 4 decoders only. **(08 Marks)**

OR

4 a. Draw the full Adder ckt from truth table. Construct a four bit adder and explain it. **(06 Marks)**
b. Draw a 1 bit comparator and explain. **(04 Marks)**
c. Develop a look ahead carry adder from full adder. Draw the compute structure including look ahead carry generator and final Adder. **(10 Marks)**

Module-3

5 a. Analyze the application of SRFF as switch debouncer with waveforms. **(04 Marks)**
b. Explain the working principles of gated SR latch with truth table next state table, excitation table and characteristic equation. **(08 Marks)**
c. Draw the Master – Slave JK flip-flop and explain its working. Draw the truth table, what is race around condition? How it can overcome? **(08 Marks)**

OR

6 a. Draw and explain universal shift Registers. **(12 Marks)**

b. Design and draw Mod 6 Asynchronous counter. **(08 Marks)**

Module-4

7 a. Construct the sequential logic circuit of following state diagram using JKFF. Clearly show the state table, transition table, excitation table, expression and sequential logic diagrams.

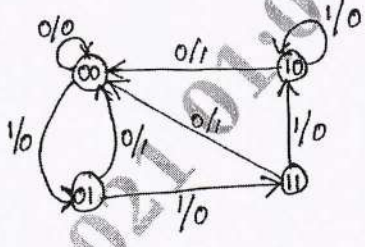


Fig Q7(a) **(10 Marks)**

b. Analyze the sequential circuit below :

i) Derive the state table

ii) Sketch the transition state diagram

iii) Describe in words the functionality of the circuit

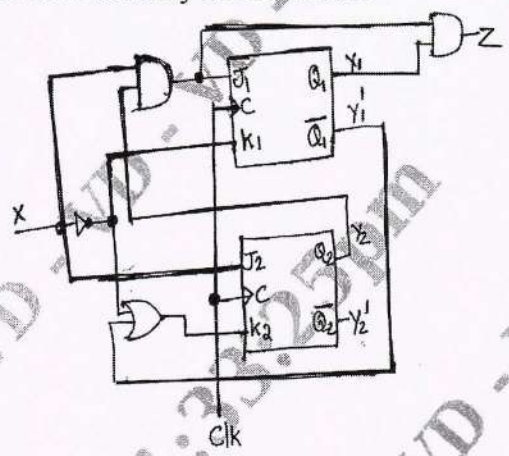
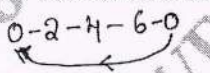


Fig Q7(b) **(10 Marks)**

OR

8 a. Design Mod 4 synchronous up down counter using JKFF. **(10 Marks)**

b. Design a synchronous counter that counts the following sequence



(10 Marks)

Module-5

9 a. What are the different VHDL Descriptions? **(05 Marks)**

b. Write the VHDL program for Half Adder in

i) Behavioral Descriptions

ii) Structural Descriptions

iii) Dataflow Descriptions **(15 Marks)**

OR

10 a. Explain the structure of Data-flow Descriptions. **(07 Marks)**

b. What are the different operators and data types in VHDL? **(08 Marks)**

c. Compare VHDL and Verilog. **(05 Marks)**

* * * * *

CBCS SCHEME

12

USN | | | | | | | | | | |

17EE36

Third Semester B.E. Degree Examination, Jan./Feb.2021
Electrical & Electronics Measurements

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a neat sketch, explain Kelvins double bridge , obtain an expression for the unknown low resistance. **(08 Marks)**

b. Discuss fall of potential method of measurement of Earth resistance. **(07 Marks)**

c. The four impedances of ac bridges are,

$z_1 = 400\angle 50^\circ\Omega$, $z_2 = 200\angle 40^\circ\Omega$, $z_3 = 800\angle -50^\circ\Omega$, $z_4 = 400\angle 20^\circ\Omega$

Find out whether bridge is balanced under there condition or not. **(05 Marks)**

OR

2 a. Explain Maxwell's Inductance bridge with neat diagram with advantages and disadvantages. **(08 Marks)**

b. With a neat circuit diagram, explain operation of modified Desautys bridge. **(06 Marks)**

c. Discuss the method of determine capacitace and dissipation factor using voltage schering bridge. **(06 Marks)**

Module-2

3 a. Discuss the errors and their compensating techniques used in dynamometer type wattmeter. **(08 Marks)**

b. With a neat sketch explain operation of Weston frequency meter. **(06 Marks)**

c. A wattmeter has a current coil of resistance 0.2 Ω and pressure coil of resistance 5000 Ω is connected to measure the power consumed by load. Calculate the percentage error in the reading of wattmeter when the load takes 20 A at 250 V with 0.8 power factor when,

(i) The pressure call is connected on supply side.
(ii) When current coil is connected on supply side.
(iii) What load current would give equal errors with two connections? **(06 Marks)**

OR

4 a. Explain working principle and construction of single phase electrodynamometer power factor meter. **(08 Marks)**

b. Explain operation of Lpf dynamometer type wattmeter. **(07 Marks)**

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

Module-3

5 a. Describe with a neat sketch measurement of Iron loss using wattmeter method. **(08 Marks)**

b. With a current of 25 mA, if the coil of the instrument has a resistance of 10 Ω, how it can be adopted to work as,

(i) Ammeter of range 0 – 20 A.
(ii) Voltmeter of range 0 – 120 V. **(05 Marks)**

c. Difference between CT and PT and explain errors in CT. **(07 Marks)**

OR

6 a. Explain the measurement of leakage factor using search coil. **(08 Marks)**
b. Explain Hopkinson's permeameter. **(06 Marks)**
c. What is shunt? How it is used to extend range of an ammeter? **(06 Marks)**

Module-4

7 a. Explain the operation of true rms reading voltmeter. **(07 Marks)**
b. With a neat diagram, explain the working of electronic multimeter. **(07 Marks)**
c. Explain the working of Ramp type digital voltmeter. **(06 Marks)**

OR

8 a. Explain working of an electronic energy meter, list the drawbacks of traditional energy meter. **(08 Marks)**
b. Explain integrating type DVM with neat sketch. **(07 Marks)**
c. A coil with a resistance of 12 Ω is connected in direct connection mode of Q meter resonance occurs. When oscillator frequency is 1 MHz and the resonating capacitor is set at 75 pf. Calculate % error introduced in calculate value of Q by 0.02 Ω insertion resistance. **(05 Marks)**

Module-5

9 a. Write a note on Nixie tube with neat sketch. **(07 Marks)**
b. With a neat diagram, explain LED display. **(07 Marks)**
c. Write a note on Dot Matrix display. **(06 Marks)**

OR

10 a. With a neat sketch, explain working of X-Y recorder. **(07 Marks)**
b. Write a note on LVDT type recorder. **(07 Marks)**
c. Explain the block diagram of ECG (Electro Cardio graph) **(06 Marks)**

* * * * *

13

CBCS SCHEME

USN | | | | | | | | | | |

17EE42

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Power Generation and Economics

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define : i) Hydrograph ii) Flow duration and Mass curve. **(06 Marks)**
b. Describe the merits and demerits of Hydro electric power plants. **(08 Marks)**
c. What are the main considerations for selection of site for a Hydro electric power station? **(06 Marks)**

OR

2 a. Explain components of Hydro Electric Power plant, with neat diagram. **(08 Marks)**
b. Explain governing mechanism of Hydraulic Impulse turbine and Reaction turbine, with neat sketches. **(08 Marks)**
c. Give the classification of Hydro Power Plant. **(04 Marks)**

Module-2

3 a. Explain briefly the functions of :
i) Reheaters ii) Condensers. **(06 Marks)**
b. Explain the working of Stoker furnace and Pulverized fuel firing. **(06 Marks)**
c. Define the term Ash handling. Why ash handling is important? Explain any three Ash handling systems. **(08 Marks)**

OR

4 a. Discuss the advantages and disadvantages of a Diesel power plant. **(06 Marks)**
b. Give the comparison of hydro power plant, with steam power plant. **(06 Marks)**
c. Describe the working of closed cycle gas turbine power plant, with a neat schematic diagram. **(08 Marks)**

Module-3

5 a. Describe the operation of nuclear power plant with the help of block diagram showing basic components. **(08 Marks)**
b. Explain the operation of Pressurized water reactor with its advantages and disadvantages. **(08 Marks)**
c. Explain Nuclear fission and Nuclear chain reaction. **(04 Marks)**

OR

6 a. Explain the function of Moderator , Coolant , Control rod and Shielding in a Nuclear reactor. **(08 Marks)**
b. Explain with respect to Nuclear plant :
i) Nuclear Waste disposal.
ii) Shielding. **(08 Marks)**
c. Discuss the various classifications of Nuclear reactors. **(04 Marks)**

Module-4

7 a. Define Substation and mention different types of substation. **(06 Marks)**

b. With a neat diagram, explain resont grounding and resistance grounding. **(08 Marks)**

c. Explain the function of :
i) Switch gear ii) Protective relay iii) High voltage Insulator. **(06 Marks)**

OR

8 a. Draw a Single line diagram of Substation and explain it. What is the role of Earthing Transformer? Explain. **(08 Marks)**

b. Explain Double BUS with sectionilisation. **(06 Marks)**

c. List out the advantages and disadvantages of Outdoor substation over Indoor substation. **(06 Marks)**

Module-5

9 a. Define the terms :
i) Load factor ii) Diversity factor iii) Plant operating factor. **(06 Marks)**

b. What is Depreciation? Explain the methods of Determination of Depreciation. **(10 Marks)**

c. Explain factors affecting Tariff. **(04 Marks)**

OR

10 a. Explain :
i) Two Part Tariff.
ii) Power Factor Tariff.
iii) Maximum Demand Tariff. **(06 Marks)**

b. State the causes and effects of a Low power factor. Also explain methods of Power Factor Improvement. **(10 Marks)**

c. Explain the concept of Choice of size and Number of Generating Units. **(04 Marks)**

* * * * *

14

CBCS SCHEME

USN | | | | | | | | | | **17EE43**

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Transmission and Distribution

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Draw a line diagram of a typical power scheme indicating the standard voltages used at different levels. Explain: i) Feeders ii) Distributors iii) Service mains. **(10 Marks)**

b. A transmission line conductor at a river crossing is supported from two towers at heights of 50 and 80 meters above water levels. The horizontal distance between the towers is 300 metres. If the tension in the conductor is 2000kg, find the clearance between the conductor and water at a point midway between the towers. Weight of conductor per metre is 0.844kg. **(10 Marks)**

OR

2 a. What are the advantages of high voltage AC transmission line? **(05 Marks)**

b. Derive an expression for string efficiency of a 3 disc string. **(05 Marks)**

c. Write short notes on:

i) Vibrations of conductors

ii) Effect of wind and Ice on transmission line. **(10 Marks)**

Module-2

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

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

c. The below Fig.Q.3(c) shows the spacing of a double limit 3-phase overhead lines. The conductor radius is 1.3cm and line is transposed. Find the inductance per phase per kilometer. **(10 Marks)**

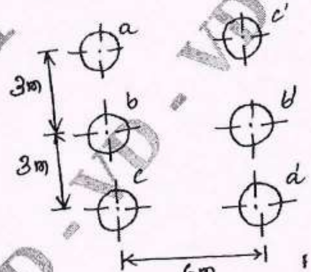


Fig.Q.3(c)

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

Module-3

5 a. Derive an expression for ABCD constants of a medium transmission line using nomial T-method. Also prove that line is symmetrical and reciprocal. **(10 Marks)**

b. A 3-ϕ short transmission line delivers 5000kW at 22kV and at a pf of 0.8 lagging to a load. Determine: i) Sending end voltage ii) % regulation iii) Transmission efficiency. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. **(10 Marks)**

OR

6 a. Explain Ferranti effect. **(06 Marks)**

b. A 3-ϕ, 50Hz, 150km transmission line has the following constants.
Resistance/phase/km = 0.1Ω
Reactance/phase/km = 0.5Ω
Capacitance shunt admittance/phase/ km = 3×10^{-6} mho
If the line supplies a load of 50MW at 0.8pf lagging at 110KV at the receiving end, calculate by using nomial π-method. i) Sending end current ii) Sending end voltage iii) Sending end power factor. **(14 Marks)**

Module-4

7 a. Explain the phenomenon of corona in overhead transmission line. Also discuss the factors affecting the corona. **(10 Marks)**

b. Derive an expression for critical disruptive voltage and visual critical voltage reference to corona. **(05 Marks)**

c. A 3-ϕ line has conductors of 2cm in diameter, spaced equilaterally 1m apart. If the dielectric strength of air is 30KV/cm (max), find the critical disruptive voltage for the line. Air density factor $\delta = 0.952$ and irregularity factor $m_0 = 0.9$. **(05 Marks)**

OR

8 a. What are the methods of grading of cables? Explain capacitance grading of cables. **(10 Marks)**

b. Discuss the different types of cables based on the voltage level. **(10 Marks)**

Module-5

9 a. Briefly explain the radial and ring main distributors. **(08 Marks)**

b. Draw the schematic diagram and hence obtain the expressions for voltages at different tappings of a DC distributor fed at one end with concentrated loads. **(12 Marks)**

OR

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

b. What are the requirements of good distribution system? **(05 Marks)**

c. A 2 wire distributor AB is fed at A and supplied six concentrated loads each of 50A at C, D, E, F, G and H as shown in Fig.Q.10(c). What must be the resistance of each section so that maximum voltage drop for any consumer does not exceed 7V. Also calculate the total power loss with this resistance. Assume that the loads are spaced at equal distances. **(10 Marks)**

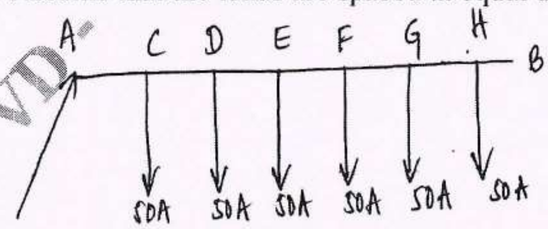


Fig.Q.10(c)

* * * * *

15

CBCS SCHEME

USN | | | | | | | | | | |

17EE44

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Electric Motors

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Derive the torque equation of a DC motor. **(07 Marks)**

b. What are the applications of DC shunt motor, Series motor and Compound motor? **(06 Marks)**

c. A 250V Shunt motor runs at 1000 rpm, while taking current of 25A. The resistance of the armature is 0.2Ω and resistance of the shunt field circuit is 250Ω. Calculate speed when loaded to take a current of 50A. If armature reaction weakens the field by 3% the voltage drop per brush is 1V, determine torque in both cases. **(07 Marks)**

OR

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

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

c. With a neat sketch, explain the Ward Leonard method of speed control of DC motor. **(05 Marks)**

Module-2

3 a. Explain briefly Field's test for determination of efficiency of DC series machines. **(07 Marks)**

b. Explain back to back test as two identical DC machines and calculate the efficiency of the machine as Motor and generator. **(06 Marks)**

c. A Field's test on two Mechanically coupled similar motors with their Field's connected in series and with one machine running as meter and other as generator, gave following data :
Motor : Armature current 40A , Armature voltage 200V , the drop across its field winding 15V.
Generator : Armature current 32A , Armature voltage 160V , the drop across its field winding 15V.
The resistance of each armature is 0.4Ω. Calculate the efficiency of each machine at this load. **(07 Marks)**

OR

4 a. Derive the torque equation for a three phase induction motor. **(06 Marks)**

b. Draw and explain the torque slip characteristics covering motoring , generating and breaking regions of operation. **(07 Marks)**

c. What is Slip? Derive the maximum running torque equations of a Induction Motor. **(07 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. **(06 Marks)**

c. Explain Cogging and Crawling in 3 – phase Induction Motor. **(08 Marks)**

OR

6 a. Explain the principle of Operation of an Induction Generator. What are its limitations? **(07 Marks)**

b. Write the procedure of drawing the circle diagram. What information can be obtained from the circle diagram? **(07 Marks)**

c. With neat diagram, explain the construction of rotor of a double cage Induction Motor. **(06 Marks)**

Module-4

7 a. Why starter is necessary for an Induction Motor? With neat diagram, explain the operation of a Star Delta Starter. **(07 Marks)**

b. Explain the method of Speed , Control of 3 – ϕ Induction Motor by varying the rotor. **(07 Marks)**

c. A squirrel cage Induction motor in a short circuit current equal to 4 times the full load current. Determine starting torque as a percentage of full load torque if full load slip is 2.5%. **(06 Marks)**

OR

8 a. Explain Construction and working principle of a shaded pole motors. **(08 Marks)**

b. Explain Double Field Revolving theory as applied to a Single Phase Induction motor. **(06 Marks)**

c. Explain with neat diagram, the working principle of capacitor start single phase Induction Motor. **(06 Marks)**

Module-5

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

b. Explain the concept of hunting in synchronous motors. What are the methods to overcome this? **(06 Marks)**

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

OR

10 a. What is Linear Induction Motor? Explain its principle of operation and draw torque speed characteristic. **(07 Marks)**

b. Explain the working , characteristic and application of AC servo motor, with neat diagram. **(07 Marks)**

c. Write note on Stepper motor and list types of it. **(06 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17EE45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Electromagnetic Field Theory

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Given three points P(2, –3, 1), Q(– 4, –2, 6) and R(1,5, –3), find
(i) Vector from P to R (ii) Unit vector of the vector from P to R (iii) Distance from P to R **(06 Marks)**

b. Transform the vector $\overline{A} = 2\hat{a}_x - 3\hat{a}_y - 1\hat{a}_z$ to cylindrical coordinates at point P(2, 3, 5)? **(08 Marks)**

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

OR

2 a. State and prove Gauss divergence theorem. **(06 Marks)**

b. If $\overline{D} = xy^2z^2\,\hat{a}_x + x^2yz^2\,\hat{a}_y + x^2y^2z\hat{a}_z$ c/m^2. Find
(i) An expression for ρ_v
(ii) Total charge within the cube defined by $0 \le x \le 2$, $0 \le y \le 2$, $0 \le z \le 2$. **(08 Marks)**

c. An infinite line charge with charge density 20 nc/m is kept along x = 2m and y = – 4m. Find the electric field intensity at a point (–2, –1, 4). **(06 Marks)**

Module-2

3 a. Prove that electric field intensity is expressed as negative gradient of Scalar Potential? **(06 Marks)**

b. Given potential field $V = 2x^2y - 5z$ volts and a point P(–4, 3, 6). Find (i) Numerical values of V and E (ii) Direction of E (iii) $\overline{D}$ (iv) Volume charge density 'ρ_v'. **(08 Marks)**

c. Determine capacitance of parallel plate capacitor consisting of two plates 30cm × 30cm surface area, separated by 5mm in air. What is the energy stored if the capacitor is charged to 500V? **(06 Marks)**

OR

4 a. With usual notations derive the expression for energy required to assemble 'n' point charges in space. **(06 Marks)**

b. Derive the boundary condition for the interface between conductor and free space. **(08 Marks)**
A spherical condenser has a capacity of 54 pF. It consists of two concentric spheres differing in radii by 4 cm and having air as dielectric. Find their radii. **(06 Marks)**

Module-3

5 a. Derive Poisson's and Laplace equations? Write Laplace equations in all 3 coordinate system. **(06 Marks)**

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

c. If $\overline{H} = 20\rho^2\hat{a}_\phi$ A / m, determine the current density $\overline{J}$ and the total current crossing a surface $\rho = 1m$; $0 \le \phi \le 2\pi$ and $2 = 0$ in cylindrical coordinate system? **(06 Marks)**

OR

6 a. State and explain (i) Biot – Savart's law (ii) Ampere's circuital law. **(06 Marks)**

b. Let $V = \frac{\cos 2\phi}{r}$ in free space, using Poisson's equations

Find (i) the volume charge density 'ρ_v' at a point A(0.5, 60°, 1) (ii) $\overline{E}$ at B(2, 30°, 1)? **(08 Marks)**

c. Explain scalar magnetic potential and vector magnetic potential? **(06 Marks)**

Module-4

7 a. Derive Lorentz's force equation with usual notations. **(06 Marks)**

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

c. Calculate the inductance of an air cored solenoid of 400 turns having 10 cm diameter and 50cm length. **(06 Marks)**

OR

8 a. Derive an expression for force on a differential current element? **(06 Marks)**

b. A current element $I_1\overline{dL_1} = 10^{-5}\hat{a}_z$ amp-m is located at $P_1(1, 0, 0)$, while second element $I_2\overline{dL_2} = 10^{-5}(0.6\hat{a}_x - 2\hat{a}_y + 3\hat{a}_z)$ amp-m is at $P_2(-1, 0, 0)$ both are in free space. Find vector force exerted on $I_2\overline{dL_2}$ by $I^1\overline{dL_1}$? **(08 Marks)**

c. A point charge $Q = -50$ nC is moving in a magnetic field of density $\overline{B} = 2\hat{a}_x - 3\hat{a}_y + 5\hat{a}_z$ mTelsa with a velocity of 6×10^6 m/s. Calculate the force in the direction specified by the unit vector $-0.48\hat{a}_x - 0.6\hat{a}_y + 0.64\hat{a}_z$ **(06 Marks)**

Module-5

9 a. List the Maxwell's equations for time varying fields in point form and integral form. **(06 Marks)**

b. Derive the Maxwell's first equation in point form for time varying field from Faraday's Law. **(06 Marks)**

c. The electric field of uniform plane wave is given by

$\overline{E} = 40\sin(30\pi\times10^6 t - 2\pi z)\hat{a}_x + 40\cos(30\pi\times10^6 t - 2\pi z)\hat{a}_y$ V/m.

Find (i) Frequency of operation (ii) Wavelength (iii) Direction of propagation of wave (iv) Associated magnetic field $\overline{H}$. **(08 Marks)**

OR

10 a. State and explain Poynting theorem. **(08 Marks)**

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

c. Write a short note on Skin depth. **(04 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17EE46

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Operational Amplifier and Linear ICs

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw the block diagram of op-amp and explain. **(08 Marks)**
b. Explain instrumentation amplifier using transducer bridge. **(08 Marks)**
c. Mention important characteristics of an ideal op-amp. **(04 Marks)**

OR

2 a. Explain with neat circuit diagram peaking amplifier. **(08 Marks)**
b. Define (i) Input bias current (ii) CMRR (iii) Input offset current. **(06 Marks)**
c. A capacitor coupled non-inverting amplifier is to have a +24V supply. A voltage gain of 100, an output amplitude of 5V, a lower cutoff frequency of 75 Hz and a minimum load resistance of 5.6 kΩ. Design suitable circuit using 741 op-amp. **(06 Marks)**

Module-2

3 a. With a neat circuit diagram explain working of 2^{nd} order high pass filter and draw its typical frequency response curve. **(08 Marks)**
b. Design first order low pass Butterworth filter at a cut off frequency of 1 kHz with passband gain of 2 and draw the circuit diagram. **(08 Marks)**
c. Define the terms with respect to voltage regulator:
(i) Line regulation (ii) Load regulation. **(04 Marks)**

OR

4 a. Explain with neat circuit diagram op-amp series voltage regulator. **(06 Marks)**
b. Write note on allpass filter. **(06 Marks)**
c. An unregulated d.c. power supply output changes from 20V to 19.7V, when the load is increased from zero to maximum, the voltage also increases to 20.2 V when the a.c supply increases by 10%. Calculate load and source effects and load and line regulation. **(08 Marks)**

Module-3

5 a. Explain with neat circuit diagram Triangular/Rectangular wave generator. **(08 Marks)**
b. Explain with neat circuit diagram R.C. phase shift oscillator using op-amp. **(06 Marks)**
c. Explain voltage to current converter with grounded load. **(06 Marks)**

OR

6 a. Explain with neat circuit diagram Weinbridge oscillator. **(08 Marks)**
b. Design non-inverting Schmitt trigger circuit to have UTP = +3V, LTP = –5V, use 741 op-amp, $V_{CC} = \pm 15V$. **(08 Marks)**
c. What is ZCD? Explain non-inverting ZCD using op-amp. **(04 Marks)**

Module-4

7 a. Explain with neat circuit precision Half Wave rectifier. **(06 Marks)**
b. What is precision rectifier? Mention its advantages. **(04 Marks)**
c. Explain R-2R ladder digital to analog converter circuit. **(10 Marks)**

OR

8	a.	Explain working of ADC using successive approximation method.	**(10 Marks)**
	b.	Explain with neat circuit diagram precision full wave rectifier.	**(10 Marks)**

Module-5

9	a.	With a neat block diagram explain basics of Phase Locked Loop.	**(08 Marks)**
	b.	Define (i) Capture range (ii) Lock range	**(04 Marks)**
	c.	Explain monostable multivibrator realized using 555 timer.	**(08 Marks)**

OR

10	a.	Explain internal architecture of IC555 timer.	**(10 Marks)**
	b.	Explain Astable multivibrator using IC555 timer.	**(10 Marks)**

* * * * *