CBCS Scheme

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

15EE32

Third Semester B.E. Degree Examination, June/July 2017
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Transform the network given in Fig Q1(a) in to a single voltage source using source transformation technique. **(05 Marks)**

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

c. Find current through 0.5Ω resistance in the Fig Q1(c) using node analysis. **(05 Marks)**

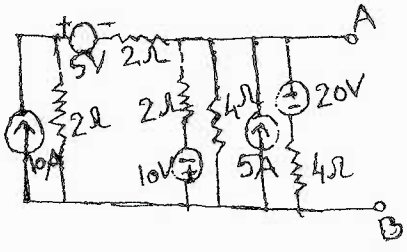

Fig Q1(a)

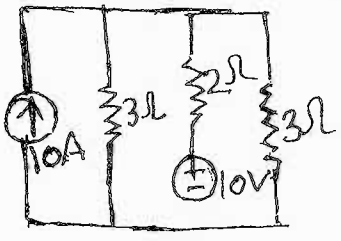

Fig Q1(b)

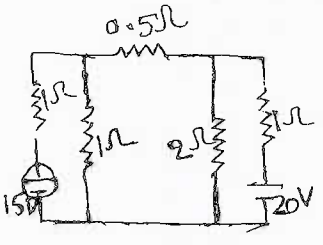

Fig Q1(c)

OR

2 a. Determine the equivalent resistance between the terminals A and B in the network in the Fig Q2 (a) using star Delta, transformation. **(06 Marks)**

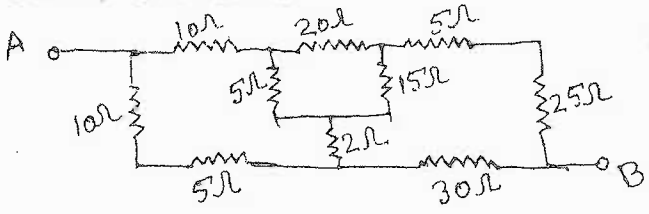

Fig Q2(a)

b. Derive expression for resonant frequency in series RLC circuit. **(05 Marks)**

c. Give the comparison between series and parallel resonance. **(05 Marks)**

Module-2

3 a. State and explain superposition theorem. **(05 Marks)**

b. Obtain the current I_x in the circuit shown in Fig Q3(b) using Thevenin's theorem. **(05 Marks)**

c. Find the Norton's equivalent circuit at the terminals A and B in the network given in Fig Q3(c). **(06 Marks)**

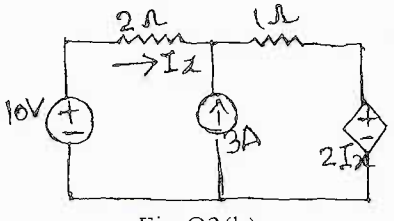

Fig Q3(b)

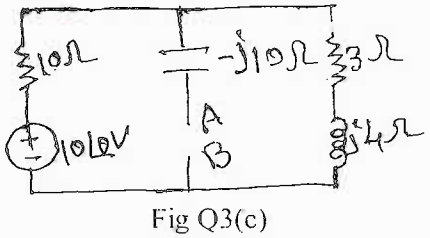

Fig Q3(c)

OR

4 a. State and explain Millman's theorem. **(05 Marks)**

b. Verify Reciprocity theorem for the network given in Fig Q4(b). **(05 Marks)**

c. Find the value of load resistance R_L for maximum power to be transferred to the load and also find maximum power for the network shown in Fig Q4(c) **(06 Marks)**

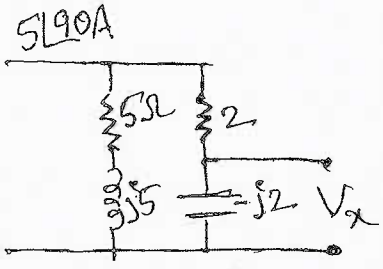

Fig Q4(b)

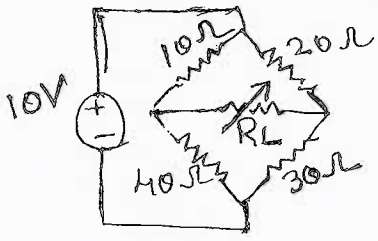

Fig Q4(c)

Module-3

5 a. Switch K is opened at time t = 0 after reaching steady state in the circuit shown in Fig Q5(a). Find V_k, $\frac{dV_k}{dt}$ and $\frac{d^2v_k}{dt^2}$ at time $t = 0^+$ **(05 Marks)**

b. In the circuit shown in Q5 (b) switch is opened at time t = 0. Find the values of V, $\frac{dV}{dt}$ and $\frac{d^2v}{dt^2}$ at $t = 0^+$ **(05 Marks)**

c. In the circuit shown in Fig Q5(c), find the current i(t). The circuit has reached steady state with switch closed and switch is open at t = 0. **(06 Marks)**

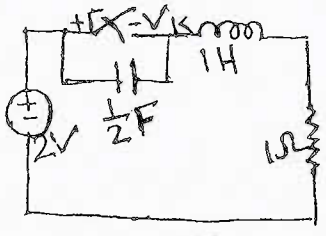

Fig Q5(a)

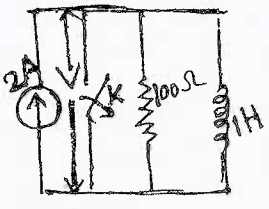

Fig Q5(b)

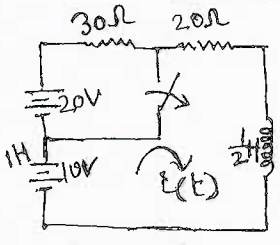

Fig Q5(c)

OR

6 a. Switch is closed at time t = 0 in the circuit shown in Fig.Q6(a). Find the values of i_1, i_2, $\frac{di_1}{dt}$, $\frac{di_2}{dt}$ at time $t = 0^+$. **(05 Marks)**

b. Switch K is opened after the circuit has reached steady state at t = 0 in the network shown in Fig.Q6(b). Find the expression for V_2 (t) for time t > 0. **(05 Marks)**

c. In the circuit shown in Fig.Q6(c) the relay is adjusted to operate at a current of 5A. Switch is closed at time t = 0 and relay is found to operate at t =0.347 sec. Find the value of inductance. **(06 Marks)**

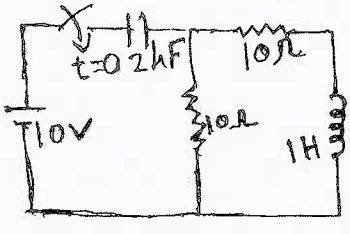

Fig.Q6(a)

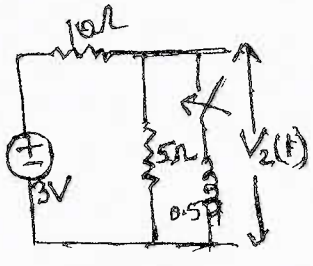

Fig.Q6(b)

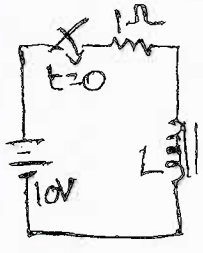

Fig.Q6(c)

Module-4

7 a. Find Laplace transform of the following functions i) sin wt ii) cos wt iii) te^{-at}. **(05 Marks)**

b. State and prove initial value theorem. **(05 Marks)**

c. In the circuit shown in Fig Q7(c) find the expression for current if switch is closed at t =0. Assume initial charge on capacitance is zero. **(06 Marks)**

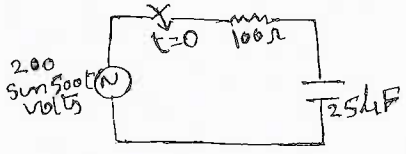

Fig Q7(c)

OR

8 a. Find inverse Laplace transform of the following functions.

i) $\frac{S^2+5}{S(S^2+4S+4)}$ ii) $\frac{2S+6}{S^2+6S+25}$ **(05 Marks)**

b. Using initial and final value theorems, where they apply, find f(0) and f(∞) for the following functions.

i) $\frac{S^3+7S^2+5}{S(S^3+3S^2+4S+2)}$ ii) $\frac{S(S+4)(S+8)}{(S+1)(S+6)}$ **(05 Marks)**

c. Find i(t) using Laplace transforms switch is closed at time t = 0 with zero initial conditions. **(06 Marks)**

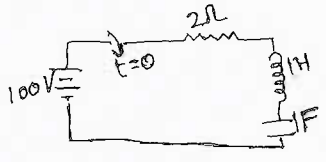

Fig Q8(c)

Module-5

9 a. Explain the method of analyzing a 3-ph star connected load by using Millman's theorem. **(05 Marks)**

b. A delta connected three phase load with impedance is connected across a 3-ph 230V, 50Hz symmetrical RYB supply. The impedances are (28 + j0)Ω, (25 + j45)Ω and (0 – j65)Ω. Find line and phase currents. **(06 Marks)**

c. Find z parameters of the circuit shown in Fig.Q9(c). **(05 Marks)**

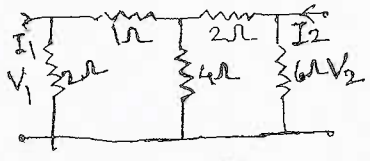

Fig Q9(c)

OR

10 a. A star connected load with (3+j0) Ω (2+j3) Ω and (2 – j1) Ω connected in 3-ph, 4 wires, Y connected system with phase sequence ACB. Find line currents and neural current. **(06 Marks)**

b. Explain the concept of unbalanced load. State various types of unbalanced loads. **(05 Marks)**

c. Find 'T' parameters of the circuit in Fig.Q10(c). **(05 Marks)**

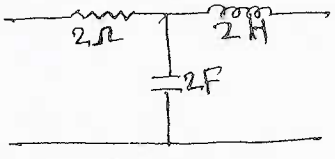

Fig Q10(c)

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CBCS Scheme

USN | 2 | V | D | 1 | 5 | E | E | 0 | 3 | 7 |

15EE33

Third Semester B. E Degree Examination, June/July 2017
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. With the help of phasor diagram. Explain the operation of practical transformer on load. **(06 Marks)**

b. A 3-phase step down transformer with per phase turns ratio 47.6:1 connected in delta/star and is supplying a load of 400kW, 0.8 p.g lagging at 400V. Calculate different line voltages and currents. **(06 Marks)**

c. Write a short note on All day efficiency. **(04 Marks)**

OR

2 a. State the advantages of single 3-phase unit transformer over bank of single phase transformers. **(06 Marks)**

b. Show that open delta connection of 3-phase transformers has KVA rating of 57.7% of that of delta-delta connection. Show the connection diagram. **(05 Marks)**

c. A 4-KVA, 200/400V single phase transformer supplying full load current of 0.8 p.f lagging. The OC/SC test results are : OC Test : 200V, 0.8A, 70W
SC Test : 20V, 10 A, 60W (HV side)
Calculate : Efficiency **(05 Marks)**

Module-2

3 a. Derive an expression for the currents and load shared by two transformers connected in parallel supplying a common load when no load voltages of these are equal. **(06 Marks)**

b. The primary and secondary voltages of an autotransformer are 230V and 75V respectively. Calculate the currents in the different parts of the winding when load current is 200A. Also calculate saving of copper. **(06 Marks)**

c. Explain why tertiary winding is used. **(04 Marks)**

OR

4 a. Explain how stabilization is achieved using tertiary winding. **(04 Marks)**

b. With the help of sketches explain the working of on load tap changer. **(06 Marks)**

c. Two single phase transformers, rated at 250KVA each are operated in parallel on both sides. Impedances of transformers are $(1+j6)\Omega$ and $(1.2 + j4.8)\Omega$ respectively. Find the load shared by each when the total load is 500KVA at 0.8 p.f lagging. **(06 Marks)**

Module-3

5 a. Write a short note on Noise in Transformer. **(04 Marks)**

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

c. Explain the methods used to reduce harmonics in three phase alternators. **(06 Marks)**

OR

6 a. Draw and explain the characteristics of DC shunt generator. **(06 Marks)**

b. Explain the polarity test with the help of connection diagram. **(04 Marks)**

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

Module-4

7 a. Define voltage regulation of an alternator. **(03 Marks)**

b. A 3-phase, 50Hz, 2-pole alternator is excited to generate the bus bar voltage of 11KV at no. load. Calculate synchronizing power per degree of mechanical displacement of the rotor. The machine is star connected and the short circuit current for this excitation is 1200A. Neglect the armature winding resistance. **(06 Marks)**

c. With phasor diagram, explain the concept of two reaction theory in a salient pole synchronous machine. **(07 Marks)**

OR

8 a. Explain the behaviour of synchronous generator on no load under variable excitation connected to infinite bus bar. **(08 Marks)**

b. A 3-phase star connected synchronous of generator supplies current of 10A having phase angle of 20° lagging at 400V. 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. **(08 Marks)**

Module-5

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

b. A 50KVA, 500V, single phase alternator gave the following test results :
OC Test : A field current of 12A produced an emf. of 300 volts.
SC Test : A field current of 12A caused a current of 175A to flow in the short circuited armature
The effective armature resistance is 0.2Ω.

i) Calculate the synchronous impedance and synchronous reactance

ii) If alternator is supplying full load current of 100A at 0.8p.f lagging, to what value would the terminal voltage rise if the load were removed? Also find the voltage regulation for this load and p.f. **(10 Marks)**

OR

10 a. Explain Potier reactance method. **(08 Marks)**

b. A 2300V, 50Hz, 3-phase star connected alternator has an armature resistance of 0.2Ω. A field current of 35A produces a current of 150A on short circuit and an open circuit emf 780V (line). Calculate the voltage regulation at 0.8 p.g lagging and 0.8p.f leading for the full load current of 25A. **(08 Marks)**

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CBCS Scheme

USN | 2 | V | D | 1 | 6 | E | F | 4 | 1 | 4 |

15EE33

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b. A 2300V, 50Hz, 3-phase star connected alternator has an armature resistance of 0.2Ω. A field current of 35A produces a current of 150A on short circuit and an open circuit emf 780V (line). Calculate the voltage regulation at 0.8 p.g lagging and 0.8p.f leading for the full load current of 25A. **(08 Marks)**

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CBCS Scheme

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

15EE34

Third Semester B.E. Degree Examination, June/July 2017
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain DC analysis of collector to base bias circuit. **(05 Marks)**

b. For the biasing circuit as shown in Fig.Q1(b), calculate I_E, I_C, V_C and V_{CE}. Given that $V_{EE} = -8V$, $R_E = 2.2\ k\Omega$, $R_B = 1.8k\Omega$, $\beta = 100$. **(05 Marks)**

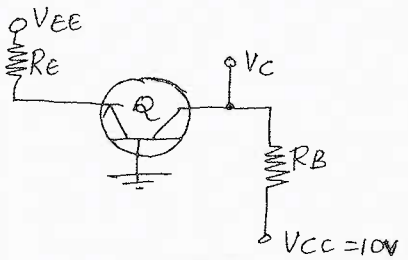

Fig.Q1(b)

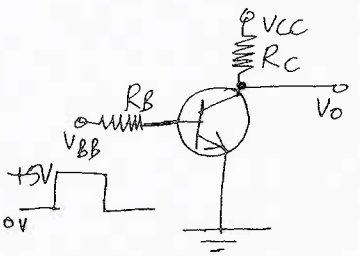

Fig.Q2(c)

c. For emitter stabilized bias circuit $V_{CC} = 10V$, $R_C = 1k\Omega$, $R_E = 500\Omega$, $R_B = 100\ k\Omega$, $\beta = 100$. Calculate I_B, I_C, V_{CE}, V_E and V_C. Draw the circuit diagram. **(06 Marks)**

OR

2 a. For the fixed bias circuit, derive expressions for S_{ICO}, S_β and S_{VBE}. **(06 Marks)**

b. For a voltage divider bias circuit, $R_C = 1k\Omega$, $R_E = 470\Omega$, $R_1 = 10k\Omega$, $R_2 = 5\ k\Omega$,, $\beta = 100$. Determine the stability factor S_{ICO}. Draw the circuit diagram. **(05 Marks)**

c. For the circuit shown in Fig.Q2(c), calculate the value of R_B that just saturates the transistor when $V_i = +5V$. Given that $R_C = 1k\Omega$, $\beta = 100$, $V_{CC} = 5V$, $V_{CE\,sat} = 0.2V$. **(05 Marks)**

Module-2

3 a. Explain hybrid equivalent model for a transistor. Develop h-parameter model for a transistor in CE, CB and CC modes. **(08 Marks)**

b. For the common base circuit shown in Fig.Q3(b), $R_C = 10\ k\Omega$, $R_E = 5\ k\Omega$, $R_S = 1\ k\Omega$, $R_L = 12\ k\Omega$, $h_{ib} = 22\Omega$, hob = 0.49 $\mu A/V$, $h_{rb} = 2.9 \times 10^{-4}$, $h_{fb} = -0.98$, Use exact h–parameter model. Calculate A_I, Z_I, A_V and A_{VS}. **(08 Marks)**

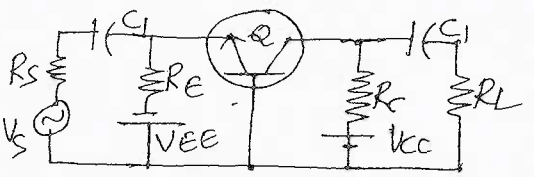

Fig.Q3(b)

OR

4 a. Explain the low frequency response by considering input RC network, output RC network. **(08 Marks)**

b. Calculate the high frequency response of amplifier circuit. Assume $R_C = 2.2k\Omega$, $R_E = 1k\Omega$, $R_1 = 68k\Omega$,, $R_2 = 22k\Omega$, $R_S = 680\Omega$, $\beta = 100$, $C_{Wi} = 6pF$, $C_{Wo} = 8pF$, $C_{cc} = 1pF$, $C_{bc} = 20\ pF$, $C_{bc} = 4pF$, $h_{ie} = 1.1\ k\Omega$, $V_{CC} = 10V$. Draw the circuit diagram. $R_L = 10k\Omega$. **(08 Marks)**

Module-3

5 a. For the 2-stage amplifier circuit as shown in Fig.Q5(a), R_S = 1 kΩ, R_{C1} = 3.3 kΩ, R_{E2} = 4.7 kΩ, h_{ie} = 2 kΩ, h_{fe} = 50, h_{re} = 0, h_{oe} = 0, calculate the overall voltage gain Av and overall Z_0. **(08 Marks)**

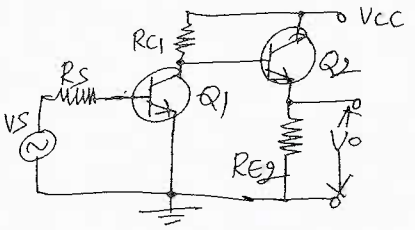

Fig.Q5(a)

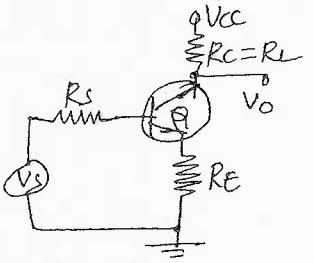

Fig.Q6(b)

b. For Darlington emitter follower circuit, obtain an expression for overall current gain A_I. **(08 Marks)**

OR

6 a. For voltage series feedback topology obtain expressions for Av and R_{if}. **(08 Marks)**

b. For the current series feedback as shown in Fig.6(b), R_L = 2.2 kΩ, R_E = 1.2 kΩ,, R_B = 1 kΩ, h_{ie} = 1.1 kΩ, h_{fe} = 50, calculate G_M, β, D, G_{MF}. **(08 Marks)**

Module-4

7 a. For transformer coupled class A power amplifier, obtain DC and AC operation and expression for maximum efficiency. **(08 Marks)**

b. A class B push pull amplifier drives a load of 16Ω, V_{CC} = 25V, number of turns in primary = 200 and that in secondary is 90. Calculate maximum power output, efficiency and maximum power dissipation per transistor. **(08 Marks)**

OR

8 a. State and explain Barkhausen criterion for sustained oscillations. **(05 Marks)**

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

c. Calculate the frequency of oscillations of colpitts oscillator if C_1 = 150 pF, C_2 = 1.5 nF and α = 50 μH. **(03 Marks)**

Module-5

9 a. What are the advantages and drawback of FET Vs BJT? **(05 Marks)**

b. For the circuit shown in Fig.Q9(b), calculate V_{GSQ}, I_{DQ}, V_{DSQ} and V_D given I_{DSS} = 10mA and V_p = –4V. **(05 Marks)**

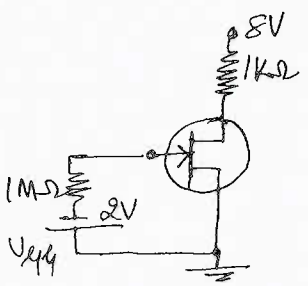

Fig.Q9(b)

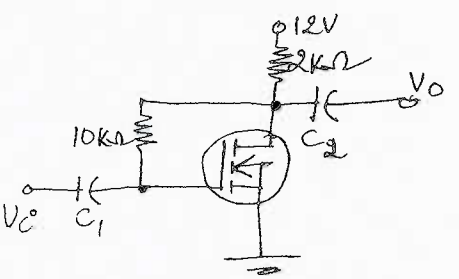

Fig.Q10(b)

c. For JFET, obtain the condition for zero current drift. **(06 Marks)**

OR

10 a. Explain construction, working and characteristics of n-channel depletion type MOSFET. **(08 Marks)**

b. For the circuit shown in Fig.Q10(b), calculate V_{GS}, I_D and V_{DS}. Given, $I_{D\ ON}$ = 6mA, $V_{GS\ ON}$ = 8V, $V_{GS\ TH}$ = 3V. **(08 Marks)**

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CBCS Scheme

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15EE35

Third Semester B.E. Degree Examination, June/July 2017
Digital System Design

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 suitably

Module-1

1 a. Write the truth table of the logic circuit having 3 inputs: A, B and C and an output $Y = AB\overline{C} + \overline{A}BC + ABC$. Also simplify the Boolean expression and implement the logic circuit using NAND gates only. **(06 Marks)**

b. Using Quine – McCluskey method, simplify: $f(a, b, c, d) = \sum m(2, 3, 4, 5, 13, 15) + dc(8, 9, 10, 11)$. **(10 Marks)**

OR

2 a. Define Canonical Minterm formula and Canonical maxterm formula with an example for each. **(04 Marks)**

b. Simplify the Boolean expression using 'd' as MEV for $f(a, b, c, d) = \sum m(2, 3, 4, 5, 8, 9, 10, 11, 13, 15)$ **(06 Marks)**

c. Design a three input, A, B and C and one output ; 'Y'; minimal, two level gate combinational circuit which has an output equal to 'zero' when majority of its inputs are at logic '1'. **(06 Marks)**

Module-2

3 a. Design a comparator to check if two N-bit numbers are equal. Configure this using cascaded stages of 1 – bit comparator. **(04 Marks)**

b. Write the compressed truth table for a 4 to 2 line priority encoder with a valid output and simplify the same using K-Map. Design the logic circuit as well. **(06 Marks)**

c. Implement the following Boolean function using a 4:1 MUX with A and B as select lines $Y = f(A, B, C, D) = \sum m(0, 1, 2, 4, 6, 9, 12, 14)$. **(06 Marks)**

OR

4 a. Write a short note on 4-bit parallel Adder. **(04 Marks)**

b. Using active high output 3:8 line decoder, implement the following functions
$f_1(A, B, C, D) = \sum m(0, 1, 2, 5, 7, 11, 15)$
$f_2(A, B, C, D) = \sum m(1, 3, 4, 11, 13, 14)$ **(06 Marks)**

c. Design an 8:1 MUX Tree using only 2:1 multiplexers. **(06 Marks)**

Module-3

5 a. With a neat logic diagram, explain working of a Master slave JK Flip-Flop along with waveforms. Also brief about Race-around condition. **(08 Marks)**

b. Convert a T – Flip-Flop to a D – Flip-Flop. **(04 Marks)**

c. Write a short note on shift Registers. **(04 Marks)**

OR

6 a. Design Synchronous Mod – 6 counter using SR Flip-Flops. **(08 Marks)**

b. Compare Asynchronous and Synchronous counters. **(04 Marks)**

c. Explain working of a 4-bit binary ripple down counter configured using negative edge triggered JK Flip-Flop with timing diagram. **(04 Marks)**

Module-4

7 a. Explain Melay and Moore models with neat block diagrams. **(04 Marks)**

b. Analyse the synchronous circuit of the Fig Q7(b) shown below.

i) Write down excitation and output functions.

ii) Form the excitation and state tables

iii) Give description of the circuit operation. **(12 Marks)**

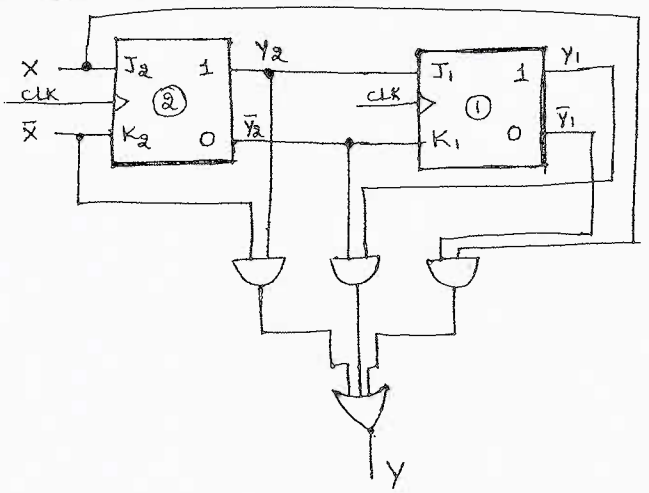

Fig Q7(b)

OR

8 a. Define state, present state, state diagram and state table. **(04 Marks)**

b. Construct Moore and Melay model state diagrams to detect input sequence 10110. When the input pattern is detected, output 'Z' is asserted HIGH. **(06 Marks)**

c. Construct a state diagram for synchronous decade UP/DOWN counter. The mode control; 'M' decides the pattern of counting operation. When M = 0 'Counter counts UP and when M = 1; the counter counts DOWN. When the counter reaches terminal count Y = 1 (for UP count) and Z = 1 (for DOWN count). Label the state diagram in M/YZ mode. **(06 Marks)**

Module-5

9 a. Mention styles/types of HDL description. Explain behavioral type with half adder example in both VHDL and verilog. **(08 Marks)**

b. Compare VHDL and verilog. **(04 Marks)**

c. Explain verilog data types. **(04 Marks)**

OR

10 a. Tabulate Rotate operators used in HDL with example operand A = 1110. **(08 Marks)**

b. Draw the block diagram of 3-bit carry look ahead adder. Write verilog code for the same. **(08 Marks)**

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CBCS Scheme

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Third Semester B.E. Degree Examination, June/July 2017
Digital System Design

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 suitably

Module-1

1 a. Write the truth table of the logic circuit having 3 inputs: A, B and C and an output $Y = AB\overline{C} + \overline{A}BC + ABC$. Also simplify the Boolean expression and implement the logic circuit using NAND gates only. **(06 Marks)**

b. Using Quine – McCluskey method, simplify: $f(a, b, c, d) = \sum m(2, 3, 4, 5, 13, 15) + dc(8, 9, 10, 11)$. **(10 Marks)**

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2 a. Define Canonical Minterm formula and Canonical maxterm formula with an example for each. **(04 Marks)**

b. Simplify the Boolean expression using 'd' as MEV for $f(a, b, c, d) = \sum m(2, 3, 4, 5, 8, 9, 10, 11, 13, 15)$ **(06 Marks)**

c. Design a three input, A, B and C and one output ; 'Y'; minimal, two level gate combinational circuit which has an output equal to 'zero' when majority of its inputs are at logic '1'. **(06 Marks)**

Module-2

3 a. Design a comparator to check if two N-bit numbers are equal. Configure this using cascaded stages of 1 – bit comparator. **(04 Marks)**

b. Write the compressed truth table for a 4 to 2 line priority encoder with a valid output and simplify the same using K-Map. Design the logic circuit as well. **(06 Marks)**

c. Implement the following Boolean function using a 4:1 MUX with A and B as select lines $Y = f(A, B, C, D) = \sum m(0, 1, 2, 4, 6, 9, 12, 14)$. **(06 Marks)**

OR

4 a. Write a short note on 4-bit parallel Adder. **(04 Marks)**

b. Using active high output 3:8 line decoder, implement the following functions
$f_1(A, B, C, D) = \sum m(0, 1, 2, 5, 7, 11, 15)$
$f_2(A, B, C, D) = \sum m(1, 3, 4, 11, 13, 14)$ **(06 Marks)**

c. Design an 8:1 MUX Tree using only 2:1 multiplexers. **(06 Marks)**

Module-3

5 a. With a neat logic diagram, explain working of a Master slave JK Flip-Flop along with waveforms. Also brief about Race-around condition. **(08 Marks)**

b. Convert a T – Flip-Flop to a D – Flip-Flop. **(04 Marks)**

c. Write a short note on shift Registers. **(04 Marks)**

OR

6 a. Design Synchronous Mod – 6 counter using SR Flip-Flops. **(08 Marks)**

b. Compare Asynchronous and Synchronous counters. **(04 Marks)**

c. Explain working of a 4-bit binary ripple down counter configured using negative edge triggered JK Flip-Flop with timing diagram. **(04 Marks)**

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ii) Form the excitation and state tables

iii) Give description of the circuit operation. **(12 Marks)**

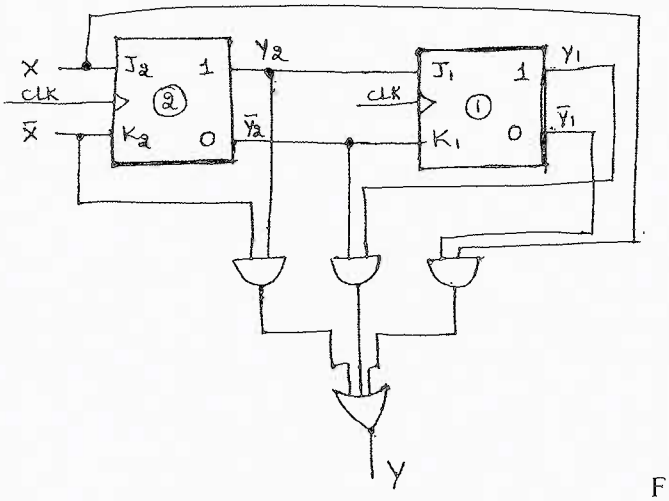

Fig Q7(b)

OR

8 a. Define state, present state, state diagram and state table. **(04 Marks)**

b. Construct Moore and Melay model state diagrams to detect input sequence 10110. When the input pattern is detected, output 'Z' is asserted HIGH. **(06 Marks)**

c. Construct a state diagram for synchronous decade UP/DOWN counter. The mode control; 'M' decides the pattern of counting operation. When M = 0 'Counter counts UP and when M = 1; the counter counts DOWN. When the counter reaches terminal count Y = 1 (for UP count) and Z = 1 (for DOWN count). Label the state diagram in M/YZ mode. **(06 Marks)**

Module-5

9 a. Mention styles/types of HDL description. Explain behavioral type with half adder example in both VHDL and verilog. **(08 Marks)**

b. Compare VHDL and verilog. **(04 Marks)**

c. Explain verilog data types. **(04 Marks)**

OR

10 a. Tabulate Rotate operators used in HDL with example operand A = 1110. **(08 Marks)**

b. Draw the block diagram of 3-bit carry look ahead adder. Write verilog code for the same. **(08 Marks)**

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10EE35

Third Semester B.E. Degree Examination, June/July 2017
Electrical and Electronic Measurements and Instrumentation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Derive the expression for the measurement of unknown resistance using Kelvin's double bridge. How the effect of connecting lead resistance is eliminated in this arrangement? **(10 Marks)**

b. The expression for the mean torque of an electro dynamometer type wattmeter may be written as : $T \alpha M^p E^q Z^t$, where M = mutual inductance between fixed and moving coils, E = applied voltage and Z = impedance of the load circuit. determine the values of p, q and t after deriving the dimensions of T, M, E and Z. **(10 Marks)**

2 a. Obtain the balance equation for Maxwell's inductance–capacitance bridge used for measurement of unknown inductance. Draw the phasor diagram at balance condition. **(10 Marks)**

b. The four arms of a bridge are :
Arm ab : an imperfect capacitor C_1 with an equivalent series resistance of r_1
Amr bc : a non inductive resistance R_3
Arm cd : a non inductive resistance R_4
Arm da : an imperfect capacitor C_2 with an equivalent series resistance of r_2 in series with a resistance R_2.
A supply of 450 Hz is given between terminal a and c and the detector is connected between b and d. At balance $R_2 = 4.8\Omega$, $R_3 = 200\Omega$, $R_4 = 2850\Omega$, $c_2 = 0.5\mu F$, $r_2 = 0.4\Omega$. Calculate the value of c_1 and r_1 and also the dissipating factor of this capacitor. **(10 Marks)**

3 a. Derive an expression for ratio and phase angle errors of C.T. with neat sketch. **(10 Marks)**

b. A CT has turns ratio 1 : 399 and is rated as 2000/5 A. The core loss component is 3A and magnetizing component is 8A, under full load conditions. Find the phase and ratio errors under full load conditions, if secondary circuit pf is 0.8 leading. **(10 Marks)**

4 a. Explain with the help of neat sketch, the construction, theory and working principle of an energy meter. **(10 Marks)**

b. With neat phasor diagram, explain the measurement of real power in 3ϕ circuits. **(08 Marks)**

c. What is creeping? **(02 Marks)**

PART – B

5 a. Explain with neat figure, Weston frequency meter. **(10 Marks)**

b. Explain with block diagram the true RMS voltmeter. **(08 Marks)**

c. What is Q meter? **(02 Marks)**

6 a. Explain with block diagram, the working of dual trace oscilloscope. **(10 Marks)**

b. Explain with block diagram, the working of digital storage oscilloscope. **(10 Marks)**

7 a. What is transducer? Briefly explain the procedure for selecting a transducer. **(06 Marks)**

b. Explain the principle of operating of LVDT in translating a linear motion into an electrical signal. **(08 Marks)**

c. Briefly explain photo conductive and photo voltaic cells. **(06 Marks)**

8 a. Explain with block diagram, the essential functional operations of a digital data acquisition system. Compare the digital and analog forms of data acquisition systems. **(08 Marks)**

b. Explain the working and application of an x-y recorder. **(08 Marks)**

c. Write a note on display devices. **(04 Marks)**

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10EE36

Third Semester B.E. Degree Examination, June/July 2017
Electric Power Generation

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Assume missing data, if any suitably.

PART – A

1 a. Discuss the importance of solar energy in the present energy crisis in the World. **(04 Marks)**
b. Explain the concept of co-generation also mention its advantages. **(08 Marks)**
c. With neat block diagram, explain the working of a geothermal power plant. **(08 Marks)**

2 a. With neat block diagram, mention the parts of diesel power plant. **(10 Marks)**
b. Explain the concept of Inter cooling in gas turbine power plant. **(04 Marks)**
c. Explain Bio-generation process also mention its advantages. **(06 Marks)**

3 a. What are the factors to be considered while selecting site for hydro - electric power plant. **(04 Marks)**
b. Calculate the average power in KW that can be generated in the hydro electric project from the following data : Catchment Area = 5×10^9 m^2 , Mean head 30mts , Annual Rain fall = 1.25 mts, Yield factor = 80% , Overall efficiency = 70% , Load factor 40%. Also calculate the maximum demand. **(08 Marks)**
c. With neat block diagram, explain the operation of Thermal power plant. **(08 Marks)**

4 a. With neat schematic diagram, explain the operation of Nuclear power plant. **(10 Marks)**
b. A thermal power plant spends Rs 25 lakh in one year as coal consumption. The coal has heating value of 5000 k cal per kg and costs Rs 500/ton. If thermal efficiency is 35% and electrical efficiency is 90%, find the average load on power plant. **(06 Marks)**
c. Explain PWR in nuclear power plant. **(04 Marks)**

PART – B

5 a. Define and explain the following terms :
i) Connected load ii) Maximum demand iii) Demand factor iv) Load factor
v) Diversity factor. **(05 Marks)**
b. Get an expression for most economical power factor. **(07 Marks)**
c. An electric supply company having a maximum load of 50 MW generates 18×10^7 units/annum and the supply consumers have the aggregate demand of 75MW. The annual expenses including capital charges are as follows :
For Fuel = Rs 90 Lakhs ; Fixed charges concerning generation = Rs 28 lakhs
Fixed charges concerning Transmission and distribution = Rs 32 lakhs.
Assuming 90% fuel cost is essential to running charges and loss in transmission and distribution as 15% of KWhr generated, deduce 2 part tariff to find actual cost of supply to consumers. **(08 Marks)**

6 a. Explain the classification of substations according to the constructional features. **(06 Marks)**
b. Discuss the different kinds of bus – bar arrangements. **(06 Marks)**

c. A load on installation is 800KW, 0.8 pf lagging which works for 3000 hrs/year. The tariff is Rs 100/KVA + 20 paise/KW hr. If the power factor is improved to 0.9 by means of loss free capacitors costing Rs 60/KVAR, calculate the annual saving effected. Allow 10% / annum for interest and depreciation on capacitors. **(08 Marks)**

7 a. Explain how the current limiting reactors are classified on their location in power system. **(10 Marks)**

b. A 3 ϕ 20 MVA , 10 KV, Alternator has internal reactance of 5% and negligible resistance. Find the external reactance / phase to be connected in series with the alternator so that steady current on short circuit does not exceed 8 times the full load current. **(05 Marks)**

c. Discuss the advantages of grounding. **(05 Marks)**

8 Write short notes on :

a. Neutral grounding. **(05 Marks)**

b. Resistance grounding. **(05 Marks)**

c. Reactance grounding. **(05 Marks)**

d. Power factor improvement equipment. **(05 Marks)**

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CBCS Scheme

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15EE36

Third Semester B.E. Degree Examination, June/July 2017
Electrical & Electronic Measurements

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive the dimensions of, (i) emf (ii) Magnetic flux density (iii) Electric flux density (iv) Current density (v) Permeability (vi) Resistivity in LMTI system of dimensions. **(06 Marks)**

b. With neat sketch, explain the operation of the Megger. **(06 Marks)**

c. The four impedances of ac bridge 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 the bridge is balanced under these condition or not. **(04 Marks)**

OR

2 a. Mention the applications and limitations of wheatstone bridge. **(06 Marks)**

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

c. Show that w^2LC is non dimensional, w being the angular frequency of the applied voltage. **(04 Marks)**

Module-2

3 a. What are the errors and adjustments in dynamometer type wattmeter? **(06 Marks)**

b. With a neat sketch, explain the operation of Weston frequency meter. **(05 Marks)**

c. A 230 V single phase watt-hour meter has a constant load of 4 A passing through it for 6 hrs at unity power factor. If the meter disc makes 2208 revolution during this period. What is the meter constant in revolution per kwh? Calculate the power factor of the load if the number of revolution made by the meter are 1472 when operating at 230 V, 5 A for 4 hrs. **(05 Marks)**

OR

4 a. Explain the operation of LPF dynamometer type wattmeter. **(06 Marks)**

b. Explain the working principle and construction of single phase electrodynamometer power factor meter. **(06 Marks)**

c. Write a note on phase sequence indicator. **(04 Marks)**

Module-3

5 a. Describe with neat sketch measurement of iron loss using wattmeter method. **(06 Marks)**

b. Explain the construction and working principle of a power transformer. **(06 Marks)**

c. Write a note on turns compensation used in current transformer. **(04 Marks)**

OR

6 a. What are shunts and multipliers? Derive an expression for shunts and multipliers with reference to the meters used in electric circuit. **(06 Marks)**

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

c. What are the advantages of instrument transformer? **(04 Marks)**

Module-4

7 a. Explain the operation of true rms reading voltmeter. **(06 Marks)**

b. Explain with the help of block diagram the function of integrating type digital voltmeter. **(06 Marks)**

c. Write a note on performance parameters of digital voltmeter. **(04 Marks)**

OR

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

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

c. Mention the advantages of electronic instruments over conventional meters. **(04 Marks)**

Module-5

9 a. Explain with suitable circuit diagram working of an cathode ray tube (CRT). **(06 Marks)**

b. Explain the principle of operation of galvanometer recorder and state its advantages. **(06 Marks)**

c. Write a note on display devices. **(04 Marks)**

OR

10 a. Explain the block diagram of an Electro Cardio Graph (ECG). **(06 Marks)**

b. Write a note on:

(i) Dot matrix display.

(ii) Bar matrix display. **(06 Marks)**

c. Distinguish between frequency modulation recording and direct recording. **(04 Marks)**

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CBCS Scheme

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15EE36

Third Semester B.E. Degree Examination, June/July 2017
Electrical & Electronic Measurements

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive the dimensions of, (i) emf (ii) Magnetic flux density (iii) Electric flux density (iv) Current density (v) Permeability (vi) Resistivity in LMTI system of dimensions. **(06 Marks)**

b. With neat sketch, explain the operation of the Megger. **(06 Marks)**

c. The four impedances of ac bridge 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 the bridge is balanced under these condition or not. **(04 Marks)**

OR

2 a. Mention the applications and limitations of wheatstone bridge. **(06 Marks)**

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

c. Show that w^2LC is non dimensional, w being the angular frequency of the applied voltage. **(04 Marks)**

Module-2

3 a. What are the errors and adjustments in dynamometer type wattmeter? **(06 Marks)**

b. With a neat sketch, explain the operation of Weston frequency meter. **(05 Marks)**

c. A 230 V single phase watt-hour meter has a constant load of 4 A passing through it for 6 hrs at unity power factor. If the meter disc makes 2208 revolution during this period. What is the meter constant in revolution per kwh? Calculate the power factor of the load if the number of revolution made by the meter are 1472 when operating at 230 V, 5 A for 4 hrs. **(05 Marks)**

OR

4 a. Explain the operation of LPF dynamometer type wattmeter. **(06 Marks)**

b. Explain the working principle and construction of single phase electrodynamometer power factor meter. **(06 Marks)**

c. Write a note on phase sequence indicator. **(04 Marks)**

Module-3

5 a. Describe with neat sketch measurement of iron loss using wattmeter method. **(06 Marks)**

b. Explain the construction and working principle of a power transformer. **(06 Marks)**

c. Write a note on turns compensation used in current transformer. **(04 Marks)**

OR

6 a. What are shunts and multipliers? Derive an expression for shunts and multipliers with reference to the meters used in electric circuit. **(06 Marks)**

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

c. What are the advantages of instrument transformer? **(04 Marks)**

Module-4

7 a. Explain the operation of true rms reading voltmeter. **(06 Marks)**

b. Explain with the help of block diagram the function of integrating type digital voltmeter. **(06 Marks)**

c. Write a note on performance parameters of digital voltmeter. **(04 Marks)**

OR

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

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

c. Mention the advantages of electronic instruments over conventional meters. **(04 Marks)**

Module-5

9 a. Explain with suitable circuit diagram working of an cathode ray tube (CRT). **(06 Marks)**

b. Explain the principle of operation of galvanometer recorder and state its advantages. **(06 Marks)**

c. Write a note on display devices. **(04 Marks)**

OR

10 a. Explain the block diagram of an Electro Cardio Graph (ECG). **(06 Marks)**

b. Write a note on:

(i) Dot matrix display.

(ii) Bar matrix display. **(06 Marks)**

c. Distinguish between frequency modulation recording and direct recording. **(04 Marks)**

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CBCS Scheme

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15EE42

Fourth Semester B.E. Degree Examination, June/July 2017
Power Generation and Economics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define : i) hydrograph ii) flow duration curve and mass curve. **(06 Marks)**

b. Explain the factors to be considered for selection of site for hydro-electric power plant. **(05 Marks)**

c. Give the classification of hydro power plant. **(05 Marks)**

OR

2 a. Explain the essential elements of hydro power plant with neat schematic diagram. **(06 Marks)**

b. Explain the governing mechanism of hydraulic impulse turbine and reaction turbine with neat sketches. **(06 Marks)**

c. Discuss the merits and demerits of hydro power plant. **(04 Marks)**

Module-2

3 a. Explain the working of steam power plant with neat schematic diagram. **(06 Marks)**

b. Explain the techniques of dust collection in thermal power station. **(06 Marks)**

c. Explain the function of air-preheater and economizer in thermal plant. **(04 Marks)**

OR

4 a. Mention the application of diesel electric power plant. **(05 Marks)**

b. With neat sketch, explain the working of a gas turbine plant. **(06 Marks)**

c. Give the comparison of hydro power plant with stream power plant. **(05 Marks)**

Module-3

5 a. Explain the nuclear reactor with neat diagram. **(06 Marks)**

b. List the advantages and disadvantages of nuclear power plant. **(05 Marks)**

c. Describe construction and working of a pressurized water reactor. **(05 Marks)**

OR

6 a. Explain the working operation of nuclear power plant with neat sketch. **(06 Marks)**

b. Give the various classifications of nuclear reactor and explain anyone. **(04 Marks)**

c. Explain the function of moderator, control rod, coolant in nuclear power plant. **(06 Marks)**

Module-4

7 a. Explain resonant grounding with a neat diagram. **(06 Marks)**

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

c. Draw a neat single diagram of substation and explain it. **(04 Marks)**

OR

8 a. Define substation and mention different types of substations. **(06 Marks)**

b. A 230V, 3ϕ, 50Hz, 200 km transmission has a capacitance to earth of 0.01mF/km per phase. Calculate the inductance and KVA rating of Peterson coil used for earthling the above system. **(05 Marks)**

c. Explain double bus without sectionlisation. **(05 Marks)**

Module-5

9 a. Define the following terms :
i) Load factor ii) diversity factor iii) plant use factor. **(06 Marks)**

b. A generating station has 3×50 MW units. The station output is 876×10^6 KWH per annum. The maximum demand is 120 MW calculate : **(06 Marks)**
i) average load on the station
ii) annual load factor
iii) annual capacity factor.

c. Explain the factors affecting tariff. **(04 Marks)**

OR

10 a. Explain : i) two part tariff ii) power factor tariff iii) maximum demand tariff. **(06 Marks)**

b. Discuss various methods of power factor improvement. **(04 Marks)**

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

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15EE43

Fourth Semester B.E. Degree Examination, June/July 2017
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 a neat diagram, explain feeders, distributor and service main of a distribution system. **(06 Marks)**

b. A transmission line conductor at a river crossing is supported from two towers at height of 50 and 80 meter above water level. The horizontal distance between the tower is 300 meters. If the tension in the conductor is 2000 kg. Find the clearance between the conductor and water at a point midway between the towers. Weight of conductor per meter = 0.844 kg. Assume that the conductor take the shape of parabolic curve. **(10 Marks)**

OR

2 a. Discuss the advantage of high voltage transmission. **(06 Marks)**

b. Each line of a 3-phase system is suspended by a string of 3 similar insulation. If the voltage across the line unit is 17.5 KV. Calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $\frac{1}{8}$th of the capacitance of the insulator itself. Also find the string efficiency. **(10 Marks)**

Module-2

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

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

c. A 3-phase, 50Hz, 132KV overhead line has conductor placed in a horizontal plane 4 meter apart. Conductor diameter is 2cm. If the line length is 100km. Calculate the charging current per phase. Assume complete transposition. **(06 Marks)**

OR

4 a. Derive a expression for the capacitance of a 3-phase overhead line for symmetrical spacing and unsymmetrical spacing. **(10 Marks)**

b. Two conductors of a single phase line each of 1 cm diameter are arranged in a vertical plane with one conductor mounted 1m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25m apart from it. The two upper and the two lower conductors are connected in parallel. Determine the inductance per km of the resulting double circuit line. **(06 Marks)**

Module-3

5 a. Two transmission lines having generalized circuit constants A_1, B_1, C_1, D_1 and A_2, B_2, C_2 D_2 are connected in series. Develop expressions for the overall constants ABCD of the combination in terms of A_1, B_1 C_1 D_1 and A_2 B_2 C_2 D_2. **(06 Marks)**

b. Derive an expression for sending end voltage and current for long transmission line using rigorous solution. **(10 Marks)**

OR

6 a. Explain with vector diagram the nominal π method for obtaining the performance of medium transmission line. **(08 Marks)**

b. An overhead 3-phase transmission line deliver 5000KW at 22 KV at 0.8 pf lagging. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. Determine sending end voltage and transmission efficiency. **(08 Marks)**

Module-4

7 a. Discuss different factors affecting corona and corona loss. **(06 Marks)**

b. A single core lead sheathed cable has a conductor diameter of 3 cm. The diameter of the cable being 9 cm. The cable is graded by using two dielectrics of relative permittivity 5 and 4 respectively with corresponding safe working stresses of 30KV/cm and 20 KV/cm. Calculate the radial thickness of each insulation and the safe working voltage of the cable. **(06 Marks)**

c. A single core cable has a conductor diameter of 1cm and insulation thickness of 0.4cm. If the specific resistance of insulation is 5×10^{14} Ω. Cm. Calculate the insulation resistance for a 2 km length of the cable. **(04 Marks)**

OR

8 a. Derive the expression for the capacitance of a single core cable. **(06 Marks)**

b. A 33 KV, 50Hz, 3-phase underground cable 4 km long uses three single core cables. Each of the conductor has a diameter of 2.5 cm and the radial thickness of insulation is 0.5cm. Determine : i) capacitance of the cable/ phase ii) charging current/phase iii) total charging KVAR. The relative permittivity of insulation is 3. **(06 Marks)**

c. Explain the following terms with reference to corona :
   i) Critical disruptive voltage
   ii) Critical visual disruptive voltage. **(04 Marks)**

Module-5

9 a. Explain radial feeders for AC distribution system. Mention the characteristics of radial feeders. **(06 Marks)**

b. A 3-phase 4wire system supplies power at 400V and lighting at 230V. If the lamps in use require 70, 84 and 33 ampere in each of the three lines. What should be the current in the neutral wire? If a 3-phase motor is now taking 200A from the lines at a pf of 0.2 lagging. What should be the total current in each line and the neutral wire? Find also the total power supplied to the lamps and the motor. **(10 Marks)**

OR

10 a. Explain 3-phase 4 wire star connected unbalanced loads for AC distribution system. **(06 Marks)**

b. A single phase AC distributor AB 300 meter long is fed from end A and is loaded as under.
   i) 100A at 0.707 pf lagging 200m from point A
   ii) 200A at 0.8 pf lagging 300m from point A.
   The load resistance and reactance of the distributor is 0.2Ω and 0.1Ω per kilometer. Calculate the total voltage drop in the distributor. The power factors refer to the voltage at the far end. **(10 Marks)**

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CBCS Scheme

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15EE44

Fourth Semester B.E. Degree Examination, June/July 2017
Electric Motors

Time: 3 hrs. Max. Marks: 80

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

Module-1

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

b. What are the applications of D.C. shunt motor, series motor and compound motor? **(05 Marks)**

c. A 4 pole D.C. shunt takes 22 amp from 220 V supply. The armature and shunt field resistances are 0.5Ω and 100Ω respectively. The armature is lap connected with 300 conductors if the flux/pole is 20 milli ωb, calculate the speed and the developed torque. **(06 Marks)**

OR

2 a. With a neat sketch, explain the Ward-Leonard method of speed control of D.C. motor. **(05 Marks)**

b. Explain the operation of a three point starter with a neat sketch. **(05 Marks)**

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

Module-2

3 a. With a neat circuit diagram, explain the importance and procedure of conducting Swinburne test on d.c. motor. Show how the efficiency as motor can be predetermined. **(05 Marks)**

b. Explain back to back test as two identical D.C. machines and calculate the efficiency of the machines as a generator and motor. **(05 Marks)**

c. A test on two coupled tram way motors, with their fields connected in series gave the following results when one machine acted as a motor and the other as a generator.
Motor: Armature current = 56 A, Armature voltage = 590 V, Voltage drop across field winding = 40 V.
Generator: Armature current = 44 A, armature voltage = 400 V, field voltage drop = 40 V, resistance of each armature = 0.3 Ω.
Calculate the efficiency of the motor and generator at this load. **(06 Marks)**

OR

4 a. Derive the torque equation for a three phase induction motor. **(05 Marks)**

b. Discuss the complete torque-slip characteristics of a three phase induction motor including motoring, generating and braking regions. **(05 Marks)**

c. A 400 V, 4 pole 3 phase, 50 Hz star connected induction motor has a rotor resistance and reactance perphase equal to 0.01Ω and 0.1Ω respectively. Determine:
i) Starting torque
ii) Slip at which maximum torque will occur
iii) Speed at which maximum torque will occur
iv) Maximum torque
v) Full load torque if full load slip is 4%.
Assume ratio of stator to rotor turns as 4. **(06 Marks)**

Module-3

5 a. Starting from the fundamentals develop the equivalent circuit of three phase induction motor. **(05 Marks)**

b. Explain the phenomenon of cogging and crawling in a 3 phase induction motor. **(05 Marks)**

c. Draw and explain the phasor diagram of a three phase induction motor. **(06 Marks)**

OR

6 a. What is induction generator? Discuss the principle of operation with the help of phasor diagram. **(06 Marks)**

b. Draw the circle diagram from No-load and short circuit test of a 3-phase 14.92 kW, 400 V, 6 pole induction motor with the following test data (line values):
No-load: 400 V, 11A, p.f. = 0.2
S.C. test: 100V, 25A, p.f. = 0.4
Rotor copper loss at stand still is half the total copper loss. From the circle diagram, find:
i) line current
ii) slip
iii) efficiency
iv) p.f. at full load
v) maximum torque. **(10 Marks)**

Module-4

7 a. Name the different methods of starting of squirrel cage induction motor. Explain star-delta starter of 3 phase squirrel cage induction motor with a suitable diagram. **(08 Marks)**

b. Describe any two methods of speed control of a 3-phase induction motor. **(08 Marks)**

OR

8 a. Explain double field revolving theory as applied to a single phase induction motor and prove that it cannot produce any starting torque. **(10 Marks)**

b. Describe the construction working and applications of shaded pole induction motor. **(06 Marks)**

Module-5

9 a. State the methods of starting synchronous motor. Explain any one in detail. **(05 Marks)**

b. Explain the operation of synchronous motor at constant load variable excitation. **(05 Marks)**

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

OR

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

b. Explain the working of permanent magnet stepper motor and give some application. **(08 Marks)**

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10EE44

Fourth Semester B.E. Degree Examination, June/July 2017
Field Theory

Time: 3 hrs. Max. Marks:100

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

PART – A

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

b. Four point charges, each of 25 nC are kept at the corners of a square of 5m. Find out the value of the charge that should be kept at the centre of the square to keep all the above charges stable at the corners of the square. **(08 Marks)**

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

2 a. Prove $E = -\nabla V$ by considering $E.\Delta l$. **(06 Marks)**

b. Find the capacitance per unit length of a cable having inner radius 'a' and outer radius 'b' by finding $\vec{E}$ and V of the cable. Use Gauss law for finding 'E' of the cable. **(06 Marks)**

c. The lines of electric field make an angle of 45° in air at the boundary between Glass ($\epsilon_r = 5$) and air ($\epsilon_r = 1$). If the electrical flux density in air (Dr) is 0.5 $\mu C/m^2$, determine the orientation and magnitude of D_g in glass. **(08 Marks)**

3 a. Derive Poisson's and Laplace equation. **(06 Marks)**

b. Determine voltage at any given point of the region between two concentric spheres of radius 'a' (inner sphere) and radius 'b' (outer sphere) using Laplace equation. Assume that inner sphere is having a potential of 100 volts and outer sphere is earthed. **(08 Marks)**

c. Find out whether $V = 2x^2 - 3y^2 + z^2$ satisfies Laplace equation or not. **(06 Marks)**

4 a. Derive Stokes theorem $\int_S (\nabla \times H) \cdot \Delta S = \oint_\ell H \cdot d\ell$ after determining $\nabla \times H = J$ by considering elemental rectangular loop in xy plane and generalizing for other. **(08 Marks)**

b. Determine magnetic field intensity and magnetic flux density of a coaxial cylinder by ampere circuital law. Radius of inner conductor is 'a' and carries a current 'I'. Outer conductor of radius 'b' is earthed. Assume that the thickness of the outer cylinder is negligible. **(06 Marks)**

c. Determine the magnetic field intensity at the centre of a square loop of 2m length carrying a current of 10A. **(06 Marks)**

PART – B

5 a. Derive an expression for the force between the current loops. **(06 Marks)**

b. A conductor length of 2.5 m located at $z = 0$, $x = 4m$ carries a current of 12A in $-\hat{a}y$ direction. Find the uniform 'B' in the region if the force on the conductor is 1.2×10^{-2} N in the direction $\frac{-\hat{a}x + \hat{a}z}{\sqrt{2}}$. **(08 Marks)**

c. An aircored torroid has a c/s of 10 cm^2, a mean radius of 15 cm and is wound with 500 turns carries a current of 5A. Find the magnetic field intensity at the mean radius. **(06 Marks)**

6 a. Write the Maxwell's equation in both point and integral form. **(06 Marks)**

b. Derive an expression for open circuit voltage of a faraday disc generator. The disc has a radius 'a' and rotate at a constant angular velocity 'w' rad/sec in a magnetic field of 'B' âz wb/m^2. The brushes are placed at the axis and rim of the disc. **(06 Marks)**

c. Explain what is meant by displacement current. What is meant by retarded potential? **(08 Marks)**

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

b. If the electric field strength is equal to 50 cos(wt – βy) âz V/m determine the displacement current density. If the same field exists in a medium whose conductivity is given by 2×10^3 ℧/cm, find the conduction current density **(08 Marks)**

c. Derive the equation $\nabla^2\vec{E} - \mu \in \frac{\partial^2 E}{\partial t^2} = \mu\frac{\partial \vec{J}}{\partial t} + \nabla\left(\frac{\rho V}{t}\right)$ from Maxwell's equations. **(06 Marks)**

8 a. Explain skin effect and its significance. **(06 Marks)**

b. With necessary expression explain standing wave ratio (SWR). **(06 Marks)**

c. Discuss wave propagation in lossy dielectric. **(08 Marks)**

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10EE45

Fourth Semester B.E. Degree Examination, June/July 2017
Power Electronics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. List and explain the different types of power electronic converters. Show their I/O characteristics. **(08 Marks)**

b. What are the peripheral effects of power converters? **(04 Marks)**

c. What is the necessity of base drive control high power transistor? Explain proportional base and anti-saturation control. **(08 Marks)**

2 a. With necessary waveforms. Explain the switching performance of power BJT. **(07 Marks)**

b. With relevant diagrams, discuss the methods of providing isolation of Gate/base drive control in power circuits and what are its limitation? **(07 Marks)**

c. In the power BJT circuit has β in the range of 10 to 25. If V_{CC} = 230V, R_c = 12Ω, V_{BB} = 15V, V_{CES} = 1.2V and V_{BES} = 1.8V. Calculate :
i) The value of R_B required to move the transistor into saturation with an ODF of 6.
ii) Forced beta β_f
iii) Total power dissipation. **(06 Marks)**

3 a. With a neat sketch, explain the static VI characteristics of an SCR. What are the significances? Define the latching current, holding current and break over voltage. **(08 Marks)**

b. With the help of two transistor model of an SCR, Derive the expression of anode current. Explain the switching action and significance of the Gate control. **(08 Marks)**

c. The SCR in the circuit of Fig Q3(c) has a latching current of 50mA and is triggered by a gate pulse width 50 µ.sec. Show that without resistance R^1 thyristor will fail to remain ON when the gating pulse ends. Also find the maximum value of R^1 to ensure firing. The ON state voltage drop of an SCR can be neglected. **(04 Marks)**

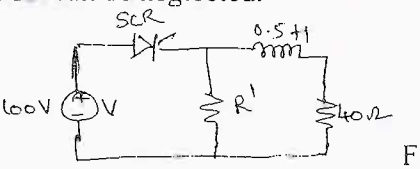

Fig Q3 (c)

4 a. Define commutation? What are the necessary conditions of commutation? Mention the different types of commutation circuits. **(08 Marks)**

b. With necessary circuit and waveforms, explain complementary commutation scheme. Derive an expression for t_c. **(08 Marks)**

c. The circuit of Fig Q4(c) employing class –C commutation has V_s = 200V, R_1 = 10Ω, R_2 = 100Ω. Determine :
i) Peak value of the current through T_1
ii) Value of capacitor C, if each thyristor has turn off time of 40 µ.sec. Take factor of safety as 2. **(04 Marks)**

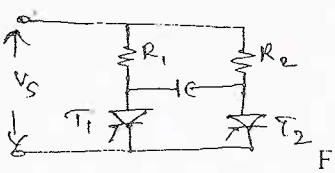

Fig Q4(c)

PART – B

5 a. What is the use of freewheeling diode in the converters? Explain the principle of operation of single phase FWR feeding with R-L loads. Draw the relevant sketch and waveforms. **(07 Marks)**

b. With neat circuit and waveforms, explain the working of three phase half wave converter. Derive the expression for $V_o(av)$ for resistive load. **(07 Marks)**

c. In the three phase half wave converter has a line – line voltage of 415V, 50Hz, the load is purely resistive load with R = 15Ω. If the average load voltage is 50% of maximum possible average output voltage. Determine :

i) The delay angle α
ii) Average values of output current
iii) The average and rms values of thyristor current. **(06 Marks)**

6 a. What is chopper? Classify the different types of choppers with circuit diagrams. **(06 Marks)**

b. With the help of circuit and quadrilateral diagrams, explain the working of a class E chopper. Mention the devices that give path for the current in each quadrant. **(08 Marks)**

c. In the chopper circuit of Fig Q6(c). The average output voltage is 109V. The voltage drop across the chopper switch when it is ON ie V_s = 2V. If the load resistance R = 10Ω, f = 1.5 KHz and duty ratio δ = 50%. Calculate :

i) The rms output voltage
ii) The dc input to the chopper
iii) Chopper efficiency
iv) Input resistance of chopper. **(06 Marks)**

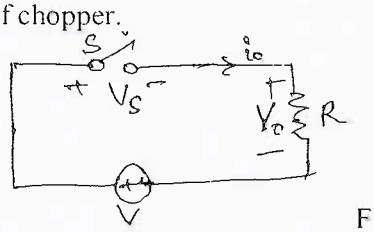

Fig Q6(c)

7 a. What do you mean by inverters? Explain the operation of single phase full bridge inverter. Draw the load current waveforms for R, R-L load and RLC loads. **(08 Marks)**

b. Explain the operation of a three phase transistorized inverter in 180° conduction angle mode with star connected Resistive load. **(08 Marks)**

c. Explain voltage control of single phase inverter by sinusoidal pulse width modulation technique. Draw relevant forms. **(04 Marks)**

8 a. What is AC voltage regulator (controller)? With the help of waveforms explain ON-OFF control and phase control. **(07 Marks)**

b. Explain the operation of a single phase bidirectional controller with resistive load. Obtain the expression for rms value of output voltage. Show their waveforms. **(08 Marks)**

c. Write a note on electromagnetic compatibility effect on power electronic converters. **(05 Marks)**

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CBCS Scheme

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Fourth Semester B.E. Degree Examination, June/July 2017
Electromagnetic Field Theory

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define scalar and vector. For a given vectors $\bar{A} = 6\bar{a}_x + 2\bar{a}_y + 6\bar{a}_z$ and $\bar{B} = -2\bar{a}_x + 9\bar{a}_y - \bar{a}_z$.
i) Show that vectors $\bar{A}$ and $\bar{B}$ are perpendicular to each other.
ii) Find $\bar{A} \times \bar{B}$ and show $\bar{A} \times \bar{B} = -\bar{B} \times \bar{A}$. **(06 Marks)**

b. Derive the relationship between rectangular and cylindrical coordinates. **(05 Marks)**

c. Using surface integral obtain an expression for surface area of a sphere of radius 'r_1' meter. **(05 Marks)**

OR

2 a. State and prove Gauss law. **(05 Marks)**

b. Two identical uniform line charges of line charge density 5 nc/mt are parallel to x-axis are kept at z = 0, y = –2 m and z = 0, y = +4 mt. Find the electric field at P(4, 1, 3) mt. Assume free space conditions and infinite line charge. **(06 Marks)**

c. If $\bar{D} = 2xy\bar{a}_x + 3yz\bar{a}_y + 4zx\bar{a}_z$ c/m^2, how much electric flux passes through that portion of the plane at x = 3 mt for which $-1 \le y \le 2$ mt and $0 \le z \le 4$ mt. **(05 Marks)**

Module-2

3 a. Show that the electric field intensity (E) can be expressed as negative gradient of scalar potential (V). **(06 Marks)**

b. Find the work done in moving a point charge of Q = -20 μC from origin to P(4, 2, 0) along the path $x^2 = 8y$. Given $\bar{E} = 2(x + 4y)\bar{a}_x + 8x\bar{a}_y$ V/m and $\epsilon = t_0$. **(06 Marks)**

c. A point charge of 1 μC is at y = -3mt and another point charge of 2 μC is at y = +3mt. Find the electric potential at a point P(4, 0, 0)mt. **(04 Marks)**

OR

4 a. With usual notations prove that $\nabla . \bar{J} = -\frac{\partial \rho_v}{\partial t}$. **(06 Marks)**

b. Derive an expression for capacitance of a parallel plate capacitor with a dielectric interface (εr_1 and εr_2) parallel to the conducting plates. **(06 Marks)**

c. A parallel plate capacitor of 8.0 nF has an area of 1.51 m^2 and separation of 10 mm. What separation would be required to obtain the 10 nF capacitance between the plates? **(04 Marks)**

Module-3

5 a. Starting from Gauss's law in integral form, derive Poisson's and Laplace equation. Write Laplace equation in all the coordinate systems. **(08 Marks)**

b. Obtain electric potential at a point between two parallel plates at z = 10 mt and z = 5 mt kept at potential of 60 Volts and 10 Volts respectively. Also find the electric field intensity at point. **(08 Marks)**

OR

6 a. Derive an expression for magnetic field intensity at a point due to an infinite long straight conductor carrying a current of I Amps along z-axis. **(06 Marks)**

b. Evaluate both sides of stokes theorem for the field $\bar{H} = 10\sin\theta\,\bar{a}_\phi$ Ampers/meter and the surface r = 3m, $0 \le \theta \le 90^\circ$, $0 \le \phi \le 90^\circ$. Let the surface has the $\bar{a}_r$ direction. What each side of stokes theorem represents? **(10 Marks)**

Module-4

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

b. A point charge of Q = –40μC is moving with a velocity of $\bar{v} = (-3\bar{a}_x - 4\bar{a}_y + 4.5\bar{a}_z) \times 10^6$ m/sec. find the magnitude of the vector force exerted on the moving particle by the field:

i) $\bar{B} = 2\bar{a}_x - 3\bar{a}_y + 5\bar{a}_z$ mT,

ii) $\bar{E} = 2\bar{a}_x + 3\bar{a}_y - 4\bar{a}_z$ KV/m,

iii) Both B and E acting together. **(08 Marks)**

OR

8 a. The z = 0 plane marks the boundary between two magnetic medium. Medium-1 is the region z > 0 and the medium-2 is the region z < 0. The magnetic flux density in the medium-1 is, $\bar{B}_1 = 1.5\bar{a}_x + 0.8\bar{a}_y + 0.6\bar{a}_z$ mT. Find:

i) The magnetic flux density in medium-2;

ii) Angle between the magnetic flux density and the boundary between two magnetic medium. Assume $\mu_{r_1} = 3$ and $\mu_{r_2} = 4$. **(07 Marks)**

b. Derive an expression for inductance of a solenoid. **(04 Marks)**

c. A solenoid with air core has 2000 turns and a length of 500 mm. Core radius is 40 mm. Find its self inductance. **(05 Marks)**

Module-5

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

b. The circular loop conductor at z = 0 plane has a radius of 0.1 mt and resistance of 5Ω. Given $\bar{B} = 0.2\sin 10^3 t\,\bar{a}_z$ Telsa. Find the current in the coil. **(06 Marks)**

c. Derive continuity equation from Maxwell equation. **(04 Marks)**

OR

10 a. Starting from Maxwell's equations obtain the general wave equations in electric and magnetic fields. **(08 Marks)**

b. A 50 GHz plane wave is travelling in a perfect dielectric medium has E_0 = 20 V/m. Find:

i) Intrinsic impedance

ii) Propogation constant

iii) Velocity of wave

iv) Magnetic field intensity.

Given $\epsilon_r = 2$ and $\mu_r = 5$. **(08 Marks)**

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10EE46

Fourth Semester B.E. Degree Examination, June/July 2017
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. With phasor diagram, explain the operation of :
i) Ideal transformer on no load
ii) Practical transformer supplying a lagging load. **(10 Marks)**

b. Write a note on current inrush phenomena in transformers. **(05 Marks)**

c. A single phase transformer with a ratio of 440V/110V takes a no load current of 5 Amps at 0.2pf lagging. If the secondary supplies a current of 120 Amps at a pf of 0.8 lagging, estimate the current taken by the primary. **(05 Marks)**

2 a. For a two winding transformer, derive an expression for the total ohmic loss in terms of the equivalent resistance refereed to either side. **(05 Marks)**

b. Derive the condition for : i) maximum voltage regulation and ii) zero voltage regulation of a transformer. **(05 Marks)**

c. Two 100 KW transformers, each has a maximum efficiency of 98%, but in one of the transformer the maximum efficiency occurs at full load while in the other, it occurs at half load. Each transformer is on full load for 4 hours, on half load for 6 hours and on one-tenth load for 14 hours per day. Determine the all-day efficiency of each transformer. **(10 Marks)**

3 a. Derive an expression for saving of copper when an auto transformer is used to supply a load instead of a two winding transformer and hence mention the advantages and limitations of an auto transformer. **(10 Marks)**

b. Two single phase transformers A and B of equal voltage ratio are operating in parallel to supply a load of 1000 Amps at 0.8pf lag. The equivalent impedance of the two transformers are (2 + j3) Ω and (2.5 + j5) Ω respectively. Calculate the current supplied by each transformer and the ratio of the KW output of the two transformers. **(10 Marks)**

4 a. What do you mean by open delta connection? When it is used? **(05 Marks)**

b. A 3-phase transformer bank is used to step-down the voltage of a 3-phase, 6600V transmission line. if the primary line current is 10A, calculate the secondary line voltage, line current and output KVA for : i) star/delta and ii) delta/star connections the turns ratio is 12. Neglect losses. **(05 Marks)**

c. Two single phase furnaces A and B are supplied at 100 volts by means of a Scott-connected transformer from a 3-phase 6600volts system. The voltage of furnace A is leading. Calculate the line currents on the 3-phase side, when the furnace A takes 400 KW at 0.707 pf lagging and B takes 800 KW at unity pf. **(10 Marks)**

PART – B

5 a. Explain principle of operation of a 3-phase induction motor. **(05 Marks)**

b. Draw and explain the Torque-slip characteristic of 3-phase induction motor covering motoring, generating and braking regions of operation. **(05 Marks)**

c. A 4pole, 50Hz, 10h-p motor has, at rated voltage and frequency, a starting torque of 160% and a maximum torque of 200% of full-load torque. Determine : i) full-load speed ii) speed at maximum torque. **(10 Marks)**

6 a. Develop the equivalent circuit of a 3-phase induction motor and draw its phasor diagram and explain. **(10 Marks)**

b. A 220V, 3-phase, 4-pole, 50Hz star-connected induction motor is rated 5hp the equivalent circuit parameters are : $R_1 = 0.45\Omega$, $x_1 = 0.8\Omega$; $R_2^{\prime} = 0.4\Omega$, $x_2^{\prime} = 0.8\Omega$. $B_0 = -1/30$ mho. The stator core loss is 50W and rotational loss is 150W. For a slip of 0.04, find : i) input current ii) pf iii) air gap power iv) mechanical power v) efficiency. **(10 Marks)**

7 Write brief notes on :

a. Double cage induction motor

b. Deep bar rotor

c. Induction generator and its applications

d. Cogging and crawling in 3-phase induction motors. **(20 Marks)**

8 a. What are the different methods of starting an induction motor? Explain star Delta starting of induction motor. **(05 Marks)**

b. A 3-phse squirrel cage induction motor has a short circuit $I_{sc} = 5I_f$ (I_f = full load current). Find the starting torque as a percentage of full load torque if the motor is started by : i) direct switching to the supply ii) a star-delta starter is used iii) an auto transformer is used iv) A resistance in the stator circuit. the starting current in iii) and iv) is 2.5 times the full load current and full load slip = 4%. **(10 Marks)**

c. Why single phase induction motors are not self starting? **(05 Marks)**

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15EE46

Fourth Semester B.E. Degree Examination, June/July 2017
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. Define and explain the following terms : input offset voltage, input offset current and input bias current. **(06 Marks)**

b. For the noninverting amplifier configuration, obtain expressions for closed loop gain. A_f from basic concepts, show that difference input voltage is zero ideally and hence gain A_f from this concept and input resistance R_{if} with feedback. **(10 Marks)**

OR

2 a. For the noninverting ac amplifier using single supply $R_{ia} = 50\Omega = R_0$, $C_i = C_1 = 0.1\mu F$, $R_1 = R_2 = R_3 = 100k\Omega$, $R_F = 1M\Omega$, $V_{cc} = +15V$, gain $A_f = 11$, uGB = 1MHz. Calculate bandwidth of amplifier and maximum output voltage swing. Draw the circuit diagram. **(06 Marks)**

b. What is an instrumentation amplifier? For instrumentation amplifier using transducer bridge obtain an expression for output voltage V_o in terms of change in resistance ΔR of the transducer. Draw the circuit diagram. **(10 Marks)**

Module-2

3 a. For the II order lowpass filter, show that the pass band voltage gain is equal to 1.586 and also obtain an expression for high cut off frequency f_H. Draw the circuit diagram. **(10 Marks)**

b. Explain the working and design of opamp voltage follower regulator. **(06 Marks)**

OR

4 a. Design a wide band pass filter with $f_a = 200Hz$, $f_H = 1KHz$ and pass band gain = 4. Assume capacitor value for high pass section = $0.05\mu F$ and for low pass section = $0.01\mu F$. Also calculate the value of Q-factor for the filter and center frequency. Draw the circuit diagram. **(06 Marks)**

b. An LM 317regulator is to provide a 6V output from 15V supply. The load current is 200mA. Design the circuit, calculate the power dissipation. Draw the circuit diagram. Select $I_1 = 1mA$, $V_{ref} = 1.25V$. **(05 Marks)**

c. Explain the working of notch filter. Draw its frequency response. State its common application. **(05 Marks)**

Module-3

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

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

OR

6 a. Explain the circuit of noninverting comparator. Draw the different waveforms when V_{REF} is positive and negative. **(06 Marks)**

b. Design a RC phase shift oscillator using opamp. Assume C =0.1μF frequency of oscillations = 200 Hz. Draw the circuit diagram. **(06 Marks)**

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

Module-4

7 a. What is the major limitation of conventional rectifier? Explain working of precision positive and negative half wave rectifier using noninverting type. **(10 Marks)**

b. Draw and explain working of dual slope ADC. **(06 Marks)**

OR

8 a. Explain the working of R – 2R ladder DAC. Assume that binary input is 001. **(05 Marks)**

b. Draw and explain the circuit of peak detector. Draw the waveforms. **(06 Marks)**

c. An 8-bit DAC has an output voltage range of 0 – 2.55 V. Define the resolution in at least 2 ways. **(05 Marks)**

Module-5

9 a. Explain operating principle of PLL. Hence define lock range, capture range, and pull in time. **(08 Marks)**

b. An astable multivibrator is to be designed for getting rectangular waveform for t_{ON} = 0.6ms. Total time period = 1ms. Assume C = 0.1μF Draw the circuit diagram. **(08 Marks)**

OR

10 a. Explain the function of various pins of IC 555 timer. **(08 Marks)**

b. Explain PLL IC565 application as frequency multiplier and frequency synthesizer. **(08 Marks)**

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10EE36

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electric Power Generation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat block diagram, explain the working of a geothermal power plant. **(06 Marks)**

b. What is co-generation? Explain with necessary block diagrams the concept of cogeneration. **(08 Marks)**

c. Write a brief note on combined heat and power distributed generation. **(06 Marks)**

2 a. Explain gas turbine power plant with a neat sketch. **(08 Marks)**

b. How do you classify the hydro electric plants? Explain clearly. **(08 Marks)**

c. What are the points to be considered for the selection of diesel power plant? **(04 Marks)**

3 a. Explain working of hydro-electric power plant, with a neat sketch. **(10 Marks)**

b. Discuss the function of elements present in thermal power plant and sketch the structure of thermal power plant. **(10 Marks)**

4 a. With a neat sketch, explain clearly the main parts of a nuclear reactor. **(10 Marks)**

b. Explain the advantages and disadvantages of nuclear power plant. Also explain the various methods of nuclear waste disposal. **(10 Marks)**

PART – B

5 a. Define the following terms as applied to power system.
i) Load Factor
ii) Demand Factor
iii) Diversity Factor
iv) Plant Capacity Factor
v) Plant Use Factor **(10 Marks)**

b. A generating station supplied the following loads: 150 MW, 120 MW, 85 MW, 60 MW and 5 MW. The station has a maximum demand of 220 MW. The annual load factor of the station is 48 percent. Calculate
i) the number of units supplied annually.
ii) the diversity factor
iii) the demand factor. **(05 Marks)**

c. A generating station has a maximum demand of 500 MW. The annual load factor is 50% and capacity factor is 40%. Find the reserve capacity of the plant. **(05 Marks)**

6 a. What is meant by tariff? Mention its objectives. **(06 Marks)**

b. With a neat sketch, explain single bus bar with sectionalizing scheme. **(06 Marks)**

c. A capital cost of a hydro-power station of 100 MW capacity is 1000 per KW. The annual depreciation charges are 15% of the capital cost. The royalty of ₹ 2 per KW per year and 0.03 per kwh generated is to be paid for using the river water for generation of power. The maximum demand on the power station is 70 MW and annual load factor is 60%. Annual cost of salaries, maintenance charges etc. is 10,00,000. If 20% of this expense is also chargeable as fixed charges, calculate the generation cost in two part form. **(08 Marks)**

7 a. With a neat sketch and phasor diagram, explain resonant grounding. **(12 Marks)**

b. With a neat sketch, explain the grounding system through an earthing transformer. **(08 Marks)**

8 a. With a neat sketch, explain ungrounded system in power system. **(10 Marks)**

b. With a neat sketch, explain solid grounding. **(10 Marks)**

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15EE36

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electrical & Electronic Measurement

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive the dimensions of resistance, inductance and capacitance in LMTI systems. **(06 Marks)**

b. Define the sensitivity of wheat stone's bridge, with the necessary circuit diagram. Hence deduce the expression for sensitivity of the bridge 'SB'. **(06 Marks)**

c. Explain sources and detectors used in AC bridges. **(04 Marks)**

OR

2 a. Expression for mean torque of an electrodynamometer type of wattmeter is given by $T_d \alpha M^a E^b Z^c$.
M – Mutual inductance between fixed and moving coil.
E – applied voltage
Z – Impedance of load circuit.
Determine value of a, b and c using dimensional analysis. **(05 Marks)**

b. Derive the balancing equation for Kelvin's double bridge. **(06 Marks)**

c. A sheet of Bakelite 4.5 mm thick is tested at 50 Hz between electrodes 0.12 m in diameter. The schering bridge employs a standard air capacitor C_2 of 106 p.f. capacitance, a non reactive resistance R_4 of $\frac{1000}{\pi}\Omega$ in parallel with a variable capacitor C_4 and non-inductive variable resistance R_3. Balance is obtained with $C_4 = 0.5\ \mu F$ and $R_3 = 260\ \Omega$. Calculate the capacitance, power factor and relative permittivity of the sheet. **(05 Marks)**

Module-2

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

b. Explain the principle of operation of 10 W power factor wattmeter. **(06 Marks)**

c. If the reading on two wattmeters in 3-phase balanced load are 836 and 224 W, the latter reading being obtained after the reversal of current coil connections, calculate the power p.f. of the load. **(04 Marks)**

OR

4 a. Discuss the various adjustments required in energy meter for the accurate reading. **(06 Marks)**

b. A single phase kwhr meter makes 500 revolutions per kwhr. It is found on testing as making 40 revolutions in 58.1 seconds at 5 kw full load. Find out the percentage error. **(04 Marks)**

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

Module-3

5 a. What is shunt? How it is used to extend the range of an ammeter? **(05 Marks)**

b. A moving coil meter gives a full scale deflection with a current of 5 mA. If the coil of the instrument has the resistance of 10 Ω, how it can be adopted to work as, (i) Ammeter of range 0 – 10 A (ii) Voltmeter of range (0 – 10 V). **(06 Marks)**

c. Write a note on turns compensation used in instrument transformers. **(05 Marks)**

OR

6 a. With neat circuit diagram, explain Silsbee's method of testing C.T. **(06 Marks)**

b. Explain the wattmeter method of measuring the iron loss. **(05 Marks)**

c. Explain Hop Kinson's permeameter. **(05 Marks)**

Module-4

7 a. With a block diagram, explain the working of a true R.M.S responding voltmeter. **(06 Marks)**

b. With a neat diagram, explain the working of an electronic multimeter. **(06 Marks)**

c. What are the errors in the measurement of Q-factor of a coil? Explain. **(04 Marks)**

OR

8 a. With a block diagram, explain the working of a Ramp type DVM. **(06 Marks)**

b. A coil with a resistance of 12 Ω is connected in the direct connection mode of Q meter. Resonance occurs when the oscillator frequency is 1 MHz and the resonating capacitor is set at 75 pf. Calculate the % error introduced in the calculated value of Q by the 0.02 Ω insertion resistance. **(05 Marks)**

c. With a neat block diagram, explain the principle of working of electronic energy meter. **(05 Marks)**

Module-5

9 a. Explain LED and LCD displays. **(08 Marks)**

b. Write a short note on nixie tube. **(04 Marks)**

c. Write a short note on stripchart recorder. **(04 Marks)**

OR

10 a. With a neat sketch, explain the working of a X-Y recorder. **(06 Marks)**

b. With the help of neat block diagram, explain ECG machine. Write important features of ECG machine. **(08 Marks)**

c. Write the features of EEG. **(02 Marks)**

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CBCS Scheme

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15EE35

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. Simplify the following Boolean function using K-map.
$f(v, w, x, y, z) = \Sigma m (3, 7, 8, 10, 11, 12, 14, 15, 17, 19, 21, 23, 25, 27, 29, 31) + \Sigma d (2, 6, 26, 30)$. **(08 Marks)**

b. Simplify the boolean expression using a 3-variable VEM with'd' as MEV.
$f(a, b, c, d) = \Sigma m (1, 3, 7, 11, 15) + \Sigma d (0, 2, 5)$. **(08 Marks)**

OR

2 a. Using Quine –McCluskey method, obtain a minimal sop expression of.
$f(w, x, y, z) = \pi m (0, 4, 5, 9) \cdot d (1, 7, 13)$. **(10 Marks)**

b. Find minimal sop expression using VEM with 'c' as MEV.
$f(a, b, c, d) = \Sigma m (3, 4, 5, 7, 8, 11, 12, 13, 15)$. **(06 Marks)**

Module-2

3 a. Realize the following Boolean function using a 8:1 MUX with wyz as select inputs.
$f(w, x, y, z) = \Sigma m (0, 1, 2, 5, 7, 8, 9, 12, 13)$. **(06 Marks)**

b. Design a 1-bit comparator using 2-4 decoder giving three outputs, G, E and L. **(04 Marks)**

c. Design a carry look ahead 4-bit parallel adder. Show that the time for addition is independent of the length of operands. **(06 Marks)**

OR

4 a. Implement a full subtractor using a 4:1 multiplexer. **(06 Marks)**

b. Design a 4 to 16 decoder by cascading 2 to 4 decoders. **(05 Marks)**

c. Explain a 4 to 2 line priority encoder with active high inputs and outputs using function table. **(05 Marks)**

Module-3

5 a. Analyse the application of SRFF as switch debouncer with waveforms. **(03 Marks)**

b. Applying 4-bit shift register, design a 4-bit twisted ring counter. **(05 Marks)**

c. Design a synchronous counter with counting sequence 3, 2, 5, 1, 0, 3 . . . . Using T.FF. **(08 Marks)**

OR

6 a. Explain race around condition. How is it eliminated? **(04 Marks)**

b. Design and implement a divide by -10 asynchronous counter using T-FFs. **(05 Marks)**

c. Design a synchronous counter to give a counting sequence 0, 2, 3, 1, 0 . . . using J.K FF. **(07 Marks)**

Module-4

7 a. Construct a sequential logic circuit with single input and single output by obtaining the state and excitation table for the given state diagram using JK FF. **(08 Marks)**

b. Analyze the following sequential circuit and obtain excitation, transition and state table. Also write the state diagram. **(08 Marks)**

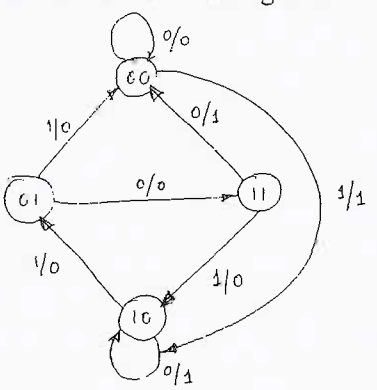

Fig Q7(a)

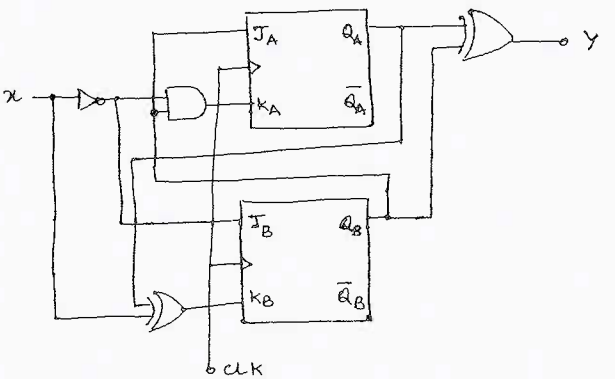

Fig Q7(b)

OR

8 a. By analyzing the sequential circuit obtain the equations for input a hence determine the excitation table, state table and state diagram. **(06 Marks)**

b. Design the sequential logic circuit for a single input and single output system from the state diagram using JKFF. Analyze through state table and excitation table. **(10 Marks)**

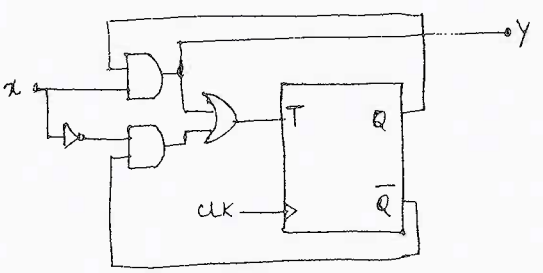

Fig Q8(a)

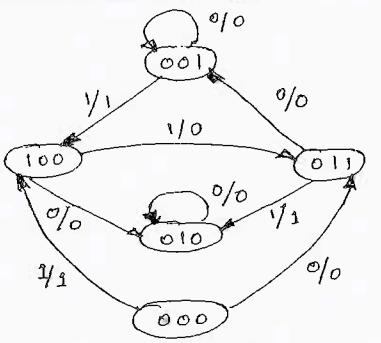

Fig Q8(b)

Module-5

9 a. Explain entity and architecture with reference to VHDL code of full adder circuit. **(06 Marks)**

b. Write VHDL code using a process and case statement to implement 4:1 multiplexer. **(04 Marks)**

c. Implement a T-FF with active low asynchronous inputs and clock input in VHDL. **(06 Marks)**

OR

10 a. Explain various data types available in VHDL. **(06 Marks)**

b. Implement a single – bit comparator for all input combinations in VHDL. **(04 Marks)**

c. Write VHDL code for edge triggered JKFF with active low asynchronous inputs. **(06 Marks)**

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10EE35

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electrical and Electronic Measurements and Instrumentation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Derive the dimensional equations for pole strength, current, mmf in the e.m. system of units. **(06 Marks)**

b. Draw the circuit of a Kelvin's double bridge used for the measurement of low resistances. Derive the condition for balance. **(07 Marks)**

c. Describe the working of a megger. **(07 Marks)**

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

b. A Maxwell's inductance comparison bridge is shown in Fig.Q.2(b). Arm ab consists of a coil with inductance L_1 and resistance r_1 in series with a non-inductive resistance R. Arm bc and ad 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_2 = 47.8 mH and R = 1.36Ω. Find the resistance and inductance of the coil in arm ab. **(08 Marks)**

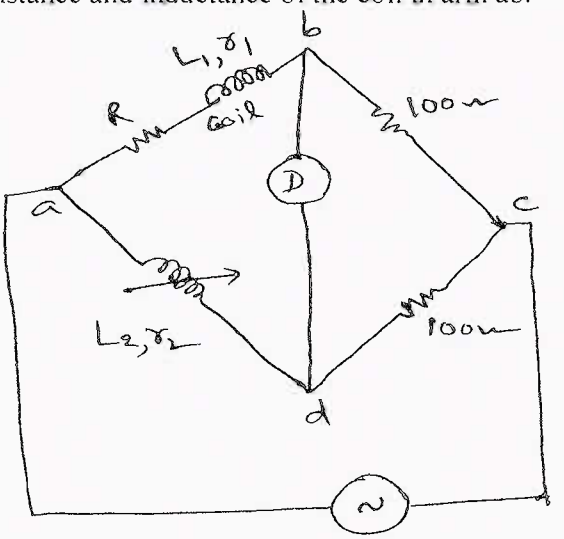

Fig.Q.2(b)

3 a. Explain Silsbees's method of testing of C.T. Derive necessary equations. **(12 Marks)**

b. A 1000/5 A, 50Hz current transformer has a secondary burden comprising a non inductive impedance of 1.6Ω. The primary winding has one turn. Calculate the flux in the core and ratio error at full load. Neglect leakage reactance and assume the iron loss in the core to be 1.5W at full load. The magnetizing mmf is 100A. **(08 Marks)**

4 a. With the help of sketch, explain principle and working of dynamometer wattmeter. (10 Marks)

b. Explain construction and working of induction type energy meter. (10 Marks)

PART – B

5 a. Explain construction and working of Weston frequency meter. (10 Marks)

b. Explain construction and working of electronic multimeter. (10 Marks)

6 a. Explain the method of Lissajous patterns used for frequency measurement. (10 Marks)

b. With a neat block diagram, explain the working of a digital storage oscilloscope. (10 Marks)

7 a. Explain working principle of LVDT with the help of neat sketch and characteristics. (12 Marks)

b. Explain different strain gauges with their principle of operation. (08 Marks)

8 a. Explain with block diagram the essential functional operation of a digital data acquisition system. (10 Marks)

b. What is a X-Y recorder? Explain with neat diagram the working of X-Y recorder. (10 Marks)

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10IT35

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electronic Instrumentation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Discuss briefly : (i) Gross error (ii) Systematic error. **(04 Marks)**
b. Explain with neat circuit diagram full wave rectifier type AC voltmeter. **(08 Marks)**
c. Explain the working of true RMS voltmeter, with a neat block diagram. **(08 Marks)**

2 a. Write the advantages of digital instruments over analog instruments. **(04 Marks)**
b. Explain the ramp type digital voltmeter with the help of a block diagram. **(08 Marks)**
c. With a neat block diagram explain the digital frequency meter. **(08 Marks)**

3 a. Explain the function of various controls on the front panel of a CRO. **(04 Marks)**
b. With neat block diagram, explain dual trace oscilloscope. **(10 Marks)**
c. With the help of basic block diagram explain the working principle of electronic switch. **(06 Marks)**

4 a. Explain the operation of digital storage oscilloscope with the help of a block diagram. Mention the advantages. **(10 Marks)**
b. With a neat block diagram explain the sampling oscilloscope. **(10 Marks)**

PART – B

5 a. Explain in detail the working of sine and square wave generator. **(10 Marks)**
b. Explain with neat block diagram operating principle of function generator. **(10 Marks)**

6 a. Explain the Wheatstone bridge and derive the balance equation for Wheatstone bridge. Mention the limitations. **(12 Marks)**
b. With a neat block diagram explain the Wagner's earth connection. **(08 Marks)**

7 a. What are the factors to be considered for the selection of better transducer? Explain. **(08 Marks)**
b. Explain the construction, principle and operation of LVDT. **(12 Marks)**

8 a. Compare LED displays and LCD displays (Any four). **(04 Marks)**
b. Explain the procedure of measuring power using a Bolometer in a bridge circuit. **(10 Marks)**
c. Write an explanatory note on signal conditioning. **(06 Marks)**

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CBCS Scheme

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15EE34

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Design a collector to base bias circuit for the following specifications : $V_{CC} = 10V$, $V_{CE} = 5V$, $I_C = 1mA$, $\beta = 50$. If β varies from 25 to 75, find the change in collector current. **(07 Marks)**

b. What are the different biasing circuits? Find an expression for stability factor 'S' of each biasing circuit. **(09 Marks)**

OR

2 a. Design a voltage divider biasing circuit with a supply voltage of 10V and $V_{CE} = \frac{V_{CC}}{2}$. The load resistance is 2KΩ. Take $\beta = 100$. **(09 Marks)**

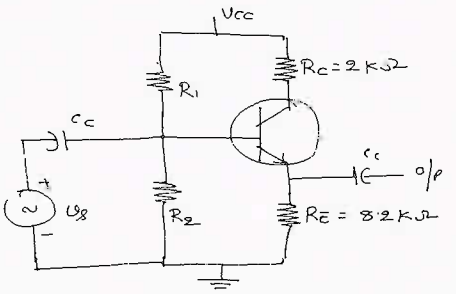
b. Explain the operation of transistor as switch along with suitable circuit and necessary waveforms. Highlight the design procedure. **(07 Marks)**

Module-2

3 a. Draw the circuit of common emitter amplifier with voltage divider biasing. Derive the expression for current gain, voltage gain, input and output impedance using the model. **(08 Marks)**

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

Fig.Q3(b)



Vcc = 10V
R1 = 47KΩ
R2 = 56KΩ
RE = 3.2 KΩ
β = 100

OR

4 a. Starting from fundamentals, define h parameters and obtain an h – parameter equivalent circuit of common emitter configuration. **(08 Marks)**

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

Module-3

5 a. What is a Cascade amplifier? Draw a practical circuit with cascade connection and derive the expressions for current gain, voltage gain, input and output impedance using r_e model. **(10 Marks)**

b. Explain the block diagram of a feedback amplifier. **(06 Marks)**

OR

6 a. Draw the circuit of Darlington emitter follower with voltage divider bias. Calculate input impedance, voltage gain and output impedance. Take $\beta_1 = \beta_2 = 100$. **(08 Marks)**
$R_1 = R_2 = 100K$, $R_E = 5k\Omega$. Take $r_e = 0.1K\Omega$.

b. Draw the block diagram of voltage series feedback amplifier and find the effect of feedback on input and output impedances. **(08 Marks)**

Module-4

7 a. Draw the circuit of class – A transformer coupled power amplifier. Explain the operation of the circuit with the help of neat waveforms. Also derive an expression for maximum efficiency of conversion. **(08 Marks)**

b. Draw the circuit of Wien bridge oscillator and derive an expression for frequency of oscillator. **(08 Marks)**

OR

8 a. Explain the classification of power amplifier with neat circuit diagram and waveforms of collector current and collector voltage for each type of power amplifier. **(10 Marks)**

b. Explain the principle of operation of oscillator and the effect of loop gain ($A\beta$) on the output of oscillator. **(06 Marks)**

Module-5

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

b. For the following circuit, find voltage gain and output impedance
i) If $r_d = 20K\Omega$ ii) If $r_d = \infty$. **(08 Marks)**

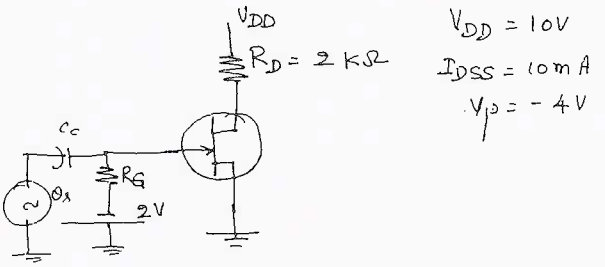


Fig.Q9(b)

OR

10 a. Explain the construction, working and characteristics of n – channel depletion MOSFET. **(08 Marks)**

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

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CBCS Scheme

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Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

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

Module-1

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

b. Develop the equivalent circuit of a single phase transformer and show that the parameters of the primary and secondary winding may be combined to give a simplified equivalent circuit referred to primary side. **(05 Marks)**

c. Find the all day efficiency of single phase transformer having maximum efficiency of 98% at 15KVA at uPF and loaded as follows.
12 hours – 2kW at 0.5 pf lagging
6 hours – 2kW at 0.8 pf lagging
6 hours – No Load. **(05 Marks)**

OR

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

b. Explain with circuit diagram and phasor diagram, how two transformers connected in open delta can supply the power successfully. **(05 Marks)**

c. Two electric furnaces are supplied with 1 phase current at 80V from a 3ϕ, 1100V system by means of two single phase scott connected transformers with similar secondary windings, when the load on one furnace is 500kW and on the other 800kW, what current will flow in each of the 3 lines
i) At UPF and ii) 0.8pf lagging. **(06 Marks)**

Module-2

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

b. Derive 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 unequal. **(06 Marks)**

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

OR

4 a. What is an Auto transformer? Derive an expression for the saving of copper in an Auto transformer as compared to an equivalent two winding transformers. What are advantages and limitations? **(08 Marks)**

b. Explain the operation of on load tap changer. **(08 Marks)**

Module-3

5 a. Discuss the harmonics in transformers. **(05 Marks)**

b. What are the sources of Noise in transformers? How to reduce the noise problem in transformers? **(05 Marks)**

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

OR

6 a. What is an armature reaction? With neat figures, explain armature reaction in DC machines under normal working conditions. **(05 Marks)**

b. What is commutation? With a neat diagram, explain the process of commutation in DC machines and explain any one method of improving commutation. **(06 Marks)**

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

Module-4

7 a. What is synchronization of alternators? What are the conditions for proper synchronization of alternators? How 3ϕ alternators are synchronized? **(08 Marks)**

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

c. Write a note on V-curves of synchronous Generator. **(03 Marks)**

OR

8 a. With a neat circuit diagram, explain the slip test on salient pole synchronous machines and indicate how X_d and X_Q can be determined from slip test. **(08 Marks)**

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

Module-5

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

b. A 2300V, 50Hz, 3ϕ star connected alternator has an effective armature resistance of 0.2Ω. A field current of 35A produces a current of 150A on short circuit and open circuit emf 780V (line). Calculate the voltage regulation at 0.8 pf lagging and 0.8pf leading for the full load current of 25A. **(08 Marks)**

OR

10 a. Write a note on capability curves of synchronous generator. **(05 Marks)**

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

c. With a neat sketch explain OCC and SCC characteristics of an alternator. **(06 Marks)**

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CBCS Scheme

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Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electric Circuit Analysis

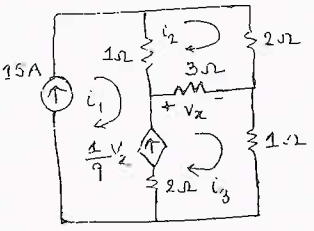
Time: 3 hrs. Max. Marks: 80

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

Module-1

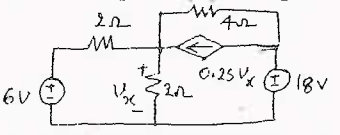
1 a. Find the three unknown currents in the circuit shown in Fig.Q.1(a) using mesh analysis. **(08 Marks)**

Fig.Q.1(a)



b. Find V_x in the circuit diagram shown in Fig.Q.1(b) using source transformation. **(08 Marks)**

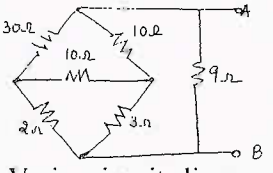
Fig.Q.1(b)



OR

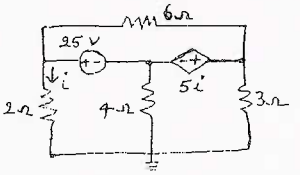
2 a. Determine the equivalent resistance between the terminals AB for the network shown in Fig.Q.2(a). **(05 Marks)**

Fig.Q.2(a)



b. Find the node voltage V_1, V_2 and V_3 in circuit diagram shown in Fig.Q.2(b) using nodal analysis. **(06 Marks)**

Fig.Q.2(b)

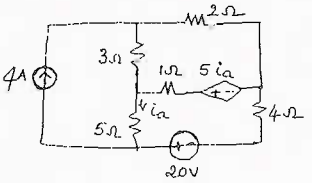


c. A series connected RLC circuit has R = 4Ω. L = 25mH. Calculate the value of C such that Q = 50. Also find resonant frequency, half power frequencies. **(05 Marks)**

Module-2

3 a. Find the current i_a in the circuit show in Fig.Q.3(a) by applying superposition theorem. **(06 Marks)**

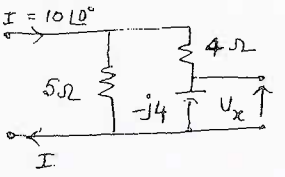
Fig.Q.3(a)



b. Obtain the condition for an alternating voltage source to transfer maximum power to the load when the load impedance is the complex conjugate of the source impedance. **(04 Marks)**

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

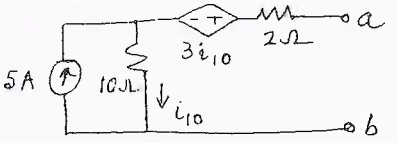
Fig.Q.3(c)



OR

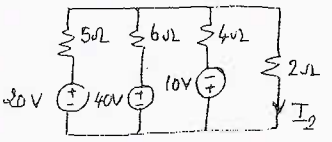
4 a. For the network shown in Fig.Q.4(a), obtain the Norton's equivalent as seen from the terminals a – b. **(08 Marks)**

Fig.Q.4(a)



b. Determine the current I_2 by applying Millman's theorem for the network shown in Fig.Q.4(b). **(08 Marks)**

Fig.Q.4(b)

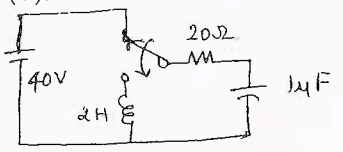


Module-3

5 a. Show the behaviour of R, L, C elements at the time of switching at t = 0 both at t = 0$^+$ and t = ∞. **(08 Marks)**

b. Determine i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0$^+$ when the switch K is moved from position 1 to 2 at t = 0 for the network shown in Fig.Q.5(b). **(08 Marks)**

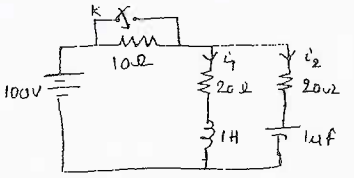
Fig.Q.5(b)



OR

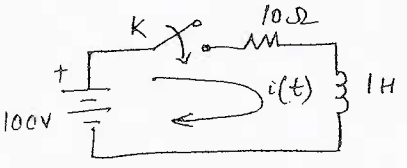
6 a. In the network shown in Fig.Q.6(a) a steady state is reached with switch 'K' open. At time t = 0, the switch is closed. Find at t = 0$^+$, $i_1(t)$, $i_2(t)$ and $\frac{di_1(t)}{dt}$. **(08 Marks)**

Fig.Q.6(a)



b. In the network shown Fig.Q.6(b) K is closed at t = 0 with zero current in the inductor. Find: i(t). $\frac{di(t)}{dt}$ at t = 0$^+$ and obtain an expression for i(t) at t ≥ 0$^+$ by classical method. **(08 Marks)**

Fig.Q.6(b)

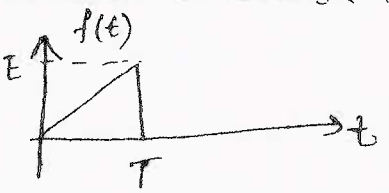


Module-4

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

b. Find the Laplace transform of the waveform shown in Fig.Q.7(b). **(06 Marks)**

Fig.Q.7(b)



c. Apply the initial and final value theorem respectively to the s-domain equations of $I_1(s)$ and $I_2(s)$ given,

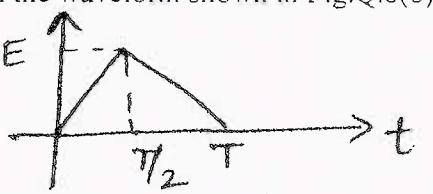
i) $I_1(s) = \dfrac{6.67(s+250)}{s(s+166.7)}$ ii) $I_2(s) = \dfrac{6.67}{s+166.7}$ **(04 Marks)**

OR

8 a. Find the Laplace transform of the shifted function given i) $10\,u(t-2)$ ii) $10\,\delta(t-2)$ iii) $10\,r(t-2)\,u(t-2)$ iv) $10\sin(t-2)\,u(t-2)$. Also sketch these functions. **(08 Marks)**

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

Fig.Q.8(b)



Module-5

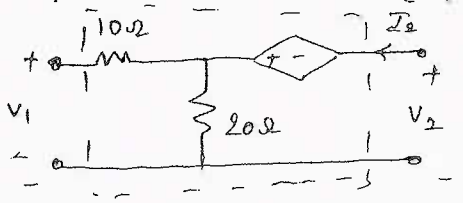
9 a. An unbalanced 3-phase, 4-wire star connected load, has balanced voltages of 208V with ABC phase sequence. Calculate the line currents and the neutral current.

$Z_A = 10\Omega$, $Z_B = 15\,\angle 30^\circ\ \Omega$, $Z_C = 10\,\angle -30^\circ\ \Omega$. **(06 Marks)**

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

c. Find the T parameters for the 2-port network shown in the Fig.9(c). **(06 Marks)**

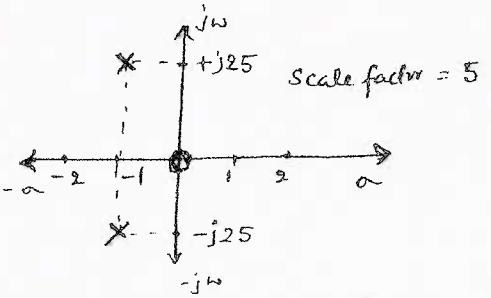
Fig.Q.9(c)



OR

10 a. A series RLC circuit has for its driving point admittance pole-zero diagram as shown in Fig.Q.10(a). Find the valves of R – L – C. **(08 Marks)**

Fig.Q.10(a)



b. Find the response i(t) when input signal i) $5\delta(t-2)$ ii) $5u(t-2)$ is given to a R – L series circuit. Assume initial current through the inductor to be zero. **(08 Marks)**

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10EE44

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Field Theory

Time: 3 hrs. Max. Marks:100

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

PART – A

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

b. Two point charges $Q_1 = -0.3nC$ at [25, –30, –15], and $Q_2 = 0.5nC$ at [–10, 8, 12] present in free space determine $\vec{E}$ at P(15, 20, 50). **(05 Marks)**

c. Given $D = 4y^2 \hat{a}_x + 3x^2 y \hat{a}_y + 15 \hat{a}_z \, C/m^2$ verify both sides of Divergence theorem and evaluate charge enclosed within region $0 < x, y, z < 2$. **(10 Marks)**

2 a. Find out the work done in moving a charge $\rho = a$ to $\rho = b$ along with radial direction due to infinite line charge. **(06 Marks)**

b. Given a potential $V = 3x^2 + 4y^2(V)$, find the energy stored in volume described by $0 \le x \le 1m$, $0 \le y \le 1m$ and $0 \le z \le 1m$. **(06 Marks)**

c. Obtain the boundary condition between conductor and free space. **(08 Marks)**

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

b. In spherical co-ordinates V = 0 at r = 0.1 m and V = 100 V at r = 2m. Assuming free space between the concentric spherical shell find $\vec{E}$ and $\vec{D}$. **(06 Marks)**

c. Use Laplace equation to find the capacitance between two plate of a parallel plate capacitor, separated by distance 'd" and maintained at potential "o" and "V_0" respectively. **(06 Marks)**

4 a. Find the magnetic field intensity and flux density at the centre, of a circular wire carrying a current 'I' and of radius 'a' by using Biot – Savart's law. **(06 Marks)**

b. In cylindrical co-ordinates a magnetic field is given as $\vec{H} = [4\rho - 2\rho^2]\hat{a}_\phi \, A/m \; 0 \le \rho \le 1$

i) Find the current density as a function of ρ within the cylinder

ii) Find the total current that passes through the surface z = 0 and $0 \le \rho \le 1m$ in $\hat{a}_z$ direction. **(06 Marks)**

c. Define vector magnetic potential and prove that $A = \frac{\mu_0}{4\pi} \int_v \frac{J}{r} \cdot dv$. **(08 Marks)**

PART – B

5 a. Derive an expression for the force between two differential current elements. **(06 Marks)**

b. The z = 0 marks the boundary between two magnetic materials. For region 1, $(z > 0)$, $\mu_1 = 4$ μH and region 2, $(z < 0)$, $\mu_2 = 6$ μH. The surface current density at the boundary is given as $\vec{K} = 12\hat{a}_y \, A/m$, find $\vec{H}_2$ if $\vec{H}_1 = 40\hat{a}_x + 50\hat{a}_y + 12\hat{a}_z \, kA/m$. **(06 Marks)**

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

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

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

c. What is retarded potential? Obtain an expression for retarded potential V and A. **(08 Marks)**

7 a. State and prove Poynting's theorem. **(10 Marks)**

b. With respect to wave propagation in good conductors, describe what is skin effect, derive an expression for the depth of penetration. If $\sigma = 58 \times 10^6$ ℧/m at frequency 10 MHz determine depth of penetration. **(10 Marks)**

8 a. The plane $x = 0$ is the boundary between two perfect dielectric. For $x < 0$, $\mu_1 = \mu_0$, $\varepsilon_1 = 3.6\pi$ pf/m and $\sigma_1 = 0$; for $x > 0$, $\mu_2 = \mu_0$, $\varepsilon_2 = 14.4\pi$ pf/m and $\sigma_2 = 0$.

If $E_i^+ = 60\cos(10^9 t - \beta_1 x) V/m$ find :

i) Incident magnetic field H_i

ii) Reflected electric and magnetic field E_r and H_r

iii) Transmitted electric and magnetic field E_t and H_t **(10 Marks)**

b. What is a standing wave? Derive an expression for standing wave ratio. **(10 Marks)**

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10EE46

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Transformers & Induction Machines

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Derive the emf equation of a single phase transformer. **(04 Marks)**

b. Explain the operation of a single phase transformer on inductive load with a phasor diagram. **(08 Marks)**

c. The maximum efficiency of a 100 kW transformer is 98% and occurs at $\frac{3}{4}$ full load. The transformer is on full load for 4 hrs, on $\frac{3}{4}$ load for 6 hrs half load for 6 hrs and $\frac{1}{10}$ load for remaining part of the day. Determine its all-day efficiency. **(08 Marks)**

2 a. Explain OC and SC test for predetermination of efficiency and regulation. **(06 Marks)**

b. Define voltage regulation and derive an expression for voltage regulation. What is the condition for zero regulation? **(06 Marks)**

c. The efficiency at 0.8 pf lag of a 6600/384 V, 200 KVA, 1 ϕ transformer is 98% both at full load and $\frac{1}{2}$ full load. The pf. on no load is 0.2 and full load regulation at a lagging pf of 0.8 is 4.5%. Draw the equivalent circuit referred to LV side and insert all values. **(08 Marks)**

3 a. Show that an auto transformer will result in saving of copper instead of 2-winding transformer. **(06 Marks)**

b. List out and explain the conditions for parallel operation of single phase transformers. **(06 Marks)**

c. Two transformers having equivalent impedances referred to secondary of $(0.3 + j3)\Omega$ and $(0.2 + j1)\Omega$ are sharing a common load of impedance $(8 + j6)\Omega$. Determine the current delivered by each transformer if the open circuit emf are 6600 V and 6400 V. **(08 Marks)**

4 a. Explain the operation of scott connections for balanced and unbalanced load with the help of phasor diagrams. **(12 Marks)**

b. A Δ - Δ bank consisting of three 1ϕ transformers, 20 KVA, 2300/230 V ratings supplies a load of 40 KVA. If one transformer is removed, find for the resulting V – V connection.
i) KVA load carried by each transformer.
ii) Total KVA rating of the V-V bank.
iii) Ratio of the V-V bank to Δ-Δ bank transformer ratings. **(08 Marks)**

PART – B

5 a. Explain the constructional details of different types of 3ϕ Induction motors. **(08 Marks)**

b. Explain the different regions of torque-slip characteristics of a 3ϕ induction motor and mark all the points on the characteristics. **(08 Marks)**

c. An 8-pole 50 Hz induction motor has a full load slip of $2\frac{1}{2}$% and a maximum torque of twice full-load torque. At what value of slip does maximum torque occur? **(04 Marks)**

6 a. Develop the phasor diagram and equivalent circuit of a 3φ induction motor. **(06 Marks)**

b. Draw the circle diagram for a 5 h.p. 200 V, 50 Hz, 4 pole, 3φ star connected induction motor from the following test data:
No load : 200 V, 5 A, 350 W
SC test : 100 V, 26 A, 1700 W
Estimate the line current and power factor for full load and also maximum torque and starting torque interms of full load torque. The rotor copper loss at stand still is half the total copper loss. **(14 Marks)**

7 a. Explain the construction and operation of a double cage induction motor. **(08 Marks)**

b. Explain the phasor diagram and torque – slip characteristics of an induction generator. **(08 Marks)**

c. Why a starter is required for starting a 3φ IM? **(04 Marks)**

8 a. Explain briefly the operation of a Y-Δ starter with a neat diagram. **(08 Marks)**

b. Give a comparison between speed control of a 3φ induction motor by stator voltage control and rotor resistance control. **(04 Marks)**

c. Explain the constructional and operational features of a capacitor start and run single phase induction motor. **(08 Marks)**

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