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Reg. No. : .....

Name : .....

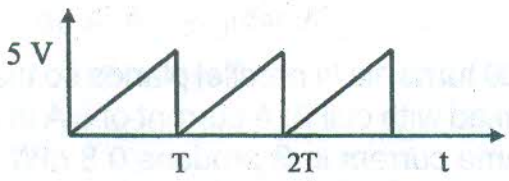
Combined First and Second Semester B.Tech. Degree Examination, December 2015
(2013 Scheme)
13.108 : FUNDAMENTALS OF ELECTRICAL ENGINEERING (E)

Time : 3 Hours Max. Marks : 100

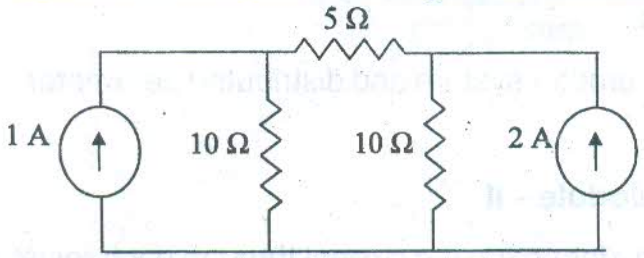
PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. State Faraday's Laws of electromagnetic induction.
2. A 2 V DC supply is applied across the square faces of a carbon rectangular block of 1.0 cm × 1.0 cm × 50.0 cm. Determine the amount of charge flowing in 4 minutes if the resistivity of carbon is $3.5 \times 10^{-5}\ \Omega$-m.
3. Determine the form factor of the following wave form.



4. Determine the current through 5 Ω resistor in the following circuit.



5. What do you mean by reluctance of a magnetic circuit ?
6. Obtain the rectangular form of the phasor, $(100 \angle 30 + 40 + j\,60)/(3 - j4)$.
7. A balanced star connected resistive load of 100 Ω per phase is connected to a balanced 3 phase 400 V supply. Determine the 3-phase power.
8. How does the time constant (τ) affect the performance of an RC-series circuit ?
9. List the applications of resonating circuit.
10. Mention the need for earthing in an electrical system.

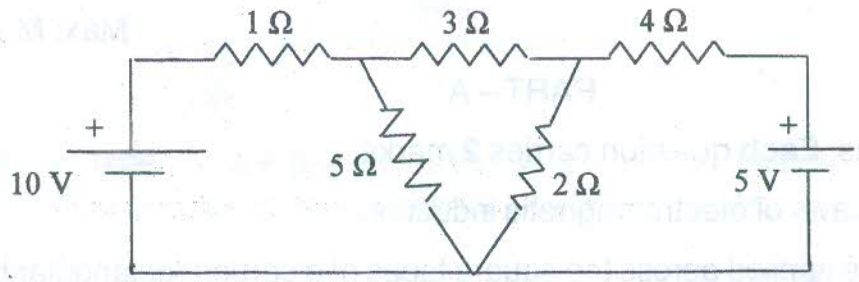
P.T.O.

PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. a) Calculate the branch currents of the network shown in the figure below, using Nodal analysis. **14**



b) From fundamentals, show that the average power consumed by a pure inductance is zero. **6**

OR

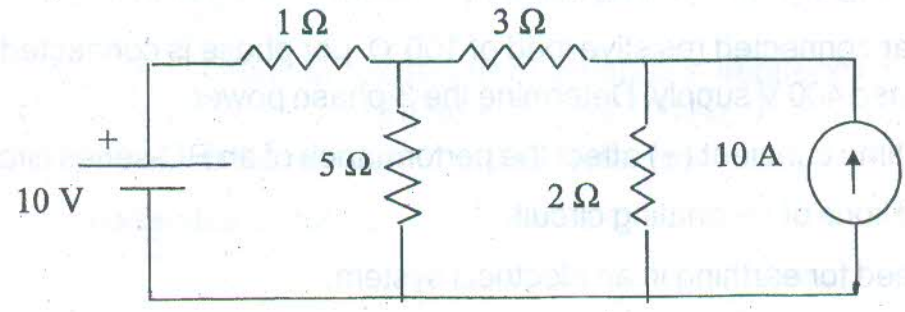
12. a) Two coils A of 12000 turns and B of 15000 turns, lie in parallel planes so that 66.6 % of the flux produced in coil A is linked with coil B. A current of 5 A in A produce a flux of 0.6 m Wb while the same current in B produce 0.8 mWb. Determine i) mutual inductance, and ii) coupling coefficient.

Derive the necessary equations. **14**

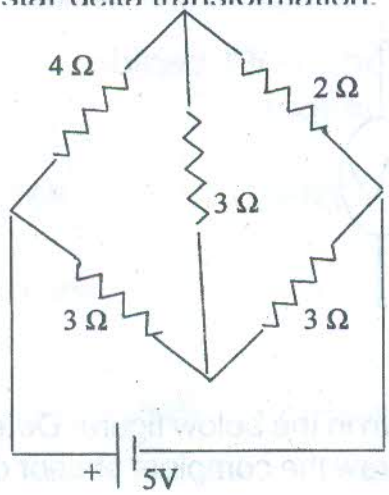
b) Distinguish between lumped parameter system and distributed parameter system with suitable examples. **6**

Module – II

13. a) Using the superposition theorem, determine the current through each resistor in the circuit shown below. **12**



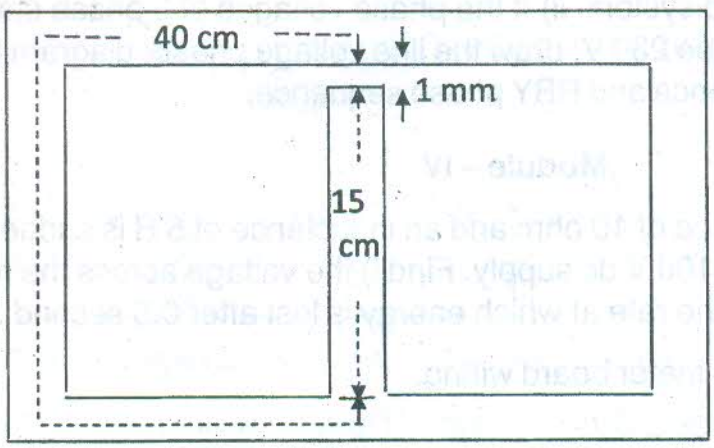
b) Calculate the battery current in the network shown in the figure below using star-delta transformation. 8



OR

14. a) State Maximum power transfer theorem. Explain the role of Thevenin's theorem in the analysis using Maximum power transfer rule. 6

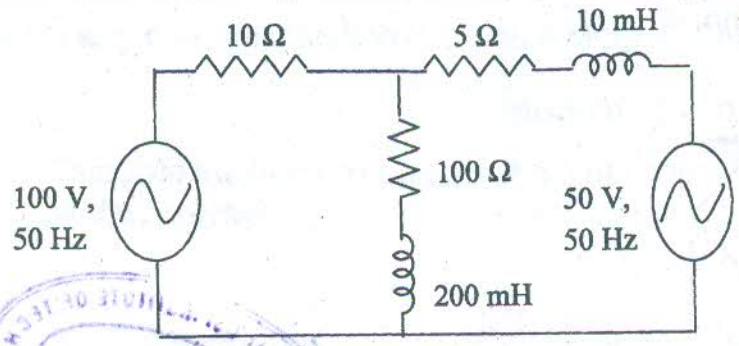
b) A rectangular iron core of permeability of 1000, with identical side limbs is shown in the figure below. It has a cross sectional area of 6 cm^2. Calculate the ampere turns required to produce a flux of 1 mWb in the central limb. 14



Module – III

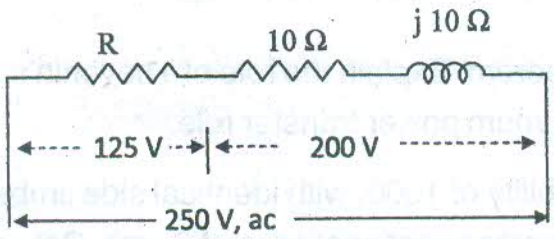
15. a) Two impedances $Z_1 = 8 + j\,10$ and $Z_2 = 6 - j\,4$ are connected in series across an ac source of 230 V, 50 Hz. Determine the power taken by each branch. Also draw the overall power triangle diagram. 8

b) Find current through the 10 ohm resistor using mesh analysis. 12



OR

16. a) The voltage division of a series circuit is shown in the below figure. Determine the value of R and circuit power factor. Also draw the complete phasor diagram. 14



b) i) Deduce the relationship between the phase and line voltages of a three phase star connected system. ii) If the phase voltages of 3 phase star connected alternator be 230 V, draw the line voltage phasor diagram for the RYB phase sequence and RBY phase sequence. 6

Module – IV

17. a) A coil having a resistance of 10 ohm and an inductance of 5 H is suddenly disconnected from the 100 V dc supply. Find i) the voltage across the resistor after 1 second, and ii) the rate at which energy is lost after 0.5 second. 14

b) Draw the schematic for meter board wiring. 6

OR

18. a) A series RLC circuit is excited from a variable frequency ac source. The maximum current occurs at a frequency of 100 Hz. The current reduces to 50% at 60 Hz. If the resistance is 3 Ω determine L and C. 14

b) Write short notes on fuses. 6