(Pages : 4) **1808**

Reg. No. : .....

Name : .....

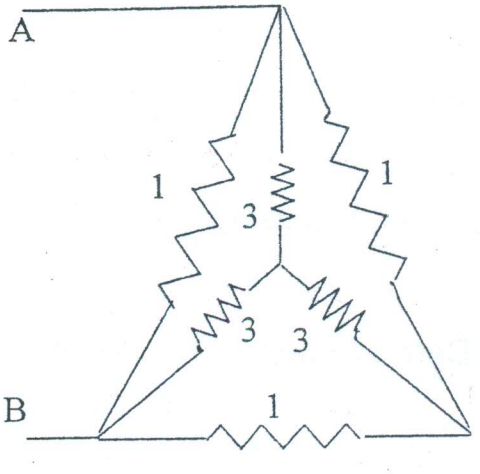
Combined First and Second Semester B.Tech. Degree Examination, April 2014
(2013 Scheme)
13.108 : FUNDAMENTALS OF ELECTRICAL ENGINEERING (E)

Time: 3 Hours Max. Marks : 100

PART – A

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

1. Two coils connected in series give a total inductance of 0.6 H and 0.1 H depending on the relative directions of the current. If one inductance is 0.2 H determine k ?
2. What do you mean by dependent sources ?
3. Calculate the change in the stored energy of a parallel plate capacitor if a dielectric slab of relative permittivity 2.3 is introduced between its two plates.
4. List the differences between the electric and magnetic circuits.
5. Determine the equivalent resistance R_{AB} using star-delta transformation (all resistances are in ohms).



P.T.O.

6. Mention the advantages of star connected 3-phase system over delta connected system.

7. Determine the line current in a balanced delta connected resistive load of 50 Ω per phase connected to balanced 3-phase 400 V supply.

8. State maximum power transfer theorem for an ac circuit.

9. Mention the significance of Q-factor with relevant diagram.

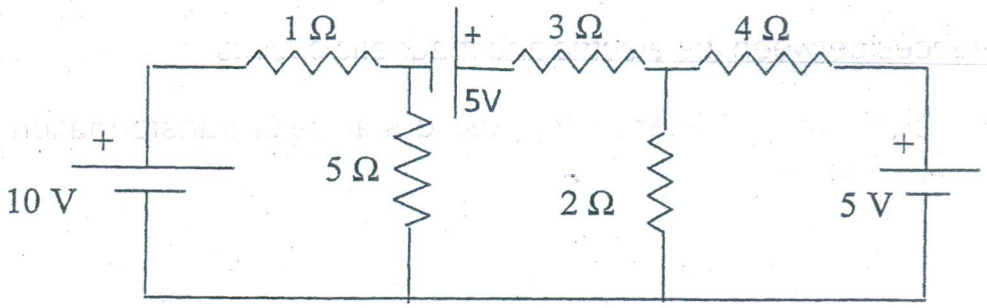
10. Why do we require an ELCB ?

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) Explain the concept of super mesh using a typical example. **6**

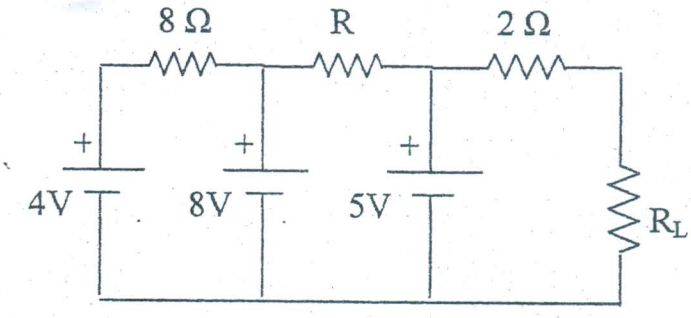
OR

12. a) Define self inductance. Derive three expression for L in terms of :
    i) flux,
    ii) physical dimensions and
    iii) rate of change of current ? **10**

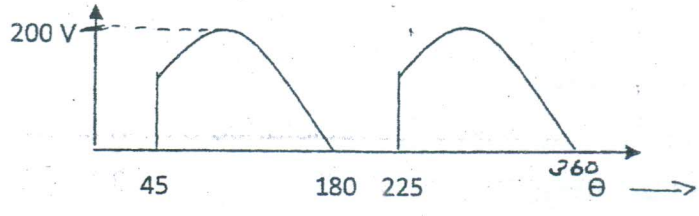
b) An aluminium wire 5 m long is connected in parallel with a copper wire 4 m long. When a current of 5 A is passed through the combination, the current in the aluminium wire is found to be 3 A. If the diameter of the aluminium wire is 1 mm, determine the diameter of the copper wire. Resistivity of copper is $0.017\,\mu\,\Omega - m$ and that of aluminium is $0.028\,\mu\,\Omega - m$. 10

Module – II

13. a) Determine the value of R so that maximum power transfer occurs when R_L is $1\,\Omega$. Also calculate the load current. 8



b) Determine the average value for the voltage waveform shown in the figure. 12



OR

14. a) A circular ring having a cross sectional area of 10 cm^2 and a diameter of 40 cm has an air gap of 1 mm made by a saw cut. The relative permeability μ_r for iron is 1000. The ring is wound with a coil of 1000 turns and 4 mA current is passed through it. Determine the air gap flux. 14

b) State and explain the Millmann's theorem. 6

Module – III

15. a) A balanced delta connected load of 8 + j6 ohm per phase is connected to a balanced 3 phase 400 V supply. Find the line current, total active power and volt-amperes. Also draw the phasor diagram. 10

b) Two coils A and B are connected in series across a 230 V, 50 Hz supply. The resistance of the first circuit is 5 Ω and inductance is 0.015 H. If the total active and reactive powers are 3 kW and 2 kVAR respectively find the impedance of the coil B. 10

OR

16. a) Each phase of the balanced star connected load consists of 80 – 60 j Ω /phase in parallel with 30 + j40 Ω /phase. Determine the line currents if connected to a balanced 3 phase 400 V supply. Also calculate the equivalent delta connected impedance for same line current. 14

b) An industrial load consists of :

a) lamp load of 5 KW at unity power factor,

b) motor load of 10 kW at 0.8 pf lag, and

c) motor load of 12 kVA at 0.7 pf lag. Draw the power triangle of the combined load. 6

Module – IV

17. a) Obtain the unit step response of a RL series circuit. 10

b) A coil A of inductance 4 mH and a series resistance 5 Ω is connected across another branch with 6 Ω resistor in series with 200 μF capacitor. Determine the resonant frequency. 10

OR

18. a) Explain any one type of earthing scheme. 8

b) A 5 μF capacitor is discharged suddenly through a coil having an inductance of 2H and a resistance of 200 Ω . The capacitor is having an initial voltage of 10 V. Determine the expression for the current. 12
