May - June - 2011

[3961] – 104

# F.E. (Semester – I) Examination, 2011
## BASIC ELECTRICAL ENGG.
## (2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions:*** *i) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer-books.*

*ii) Answer question No.* ***1*** *or* ***2****, Q. No.* ***3*** *or* ***4****, Q. No.* ***5*** *or* ***6****, from Section* ***I*** *and Question No.* ***7*** *or* ***8****, Q. No.* ***9*** *or* ***10****, Q. No.* ***11*** *or* ***12*** *from Section* ***II****.*

*iii) Figures to the* ***right*** *indicate* ***full*** *marks.*

*iv)* ***Use*** *of non-programmable pocket size scientific calculator is* ***permitted****.*

*v)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

*vi) Assume suitable additional data, if* ***necessary****.*

SECTION – I

1. a) With neat sketch explain the construction and working of Lead Acid Cell. **6**

   b) A coil has a resistance of 40 Ω at 25° C. When its temperature is increased to 110° C the resistance increases to 50 Ω. Calculate the temperature coefficient of resistance of coil material at i) 25° C ii) 110° C and iii) 0° C. **6**

   c) Write down chemical equations during charging of Lead Acid Cell. **4**

   OR

2. a) With usual notations prove that $(\alpha_1 - \alpha_2) = \alpha_1 \alpha_2 (t_2 - t_1)$. **6**

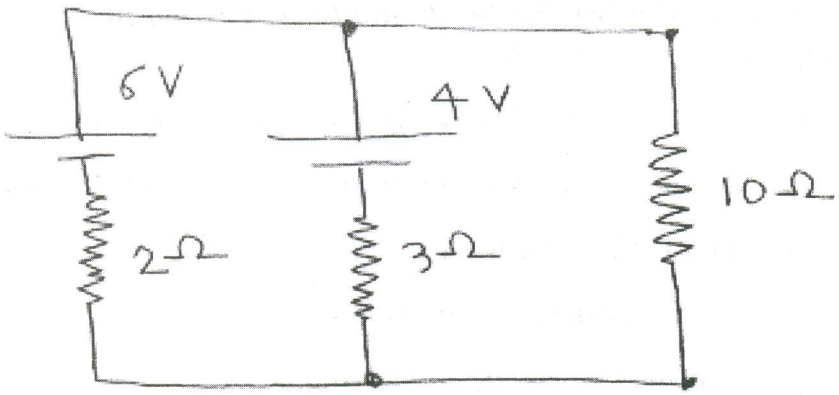
   b) What is insulation resistance ? Derive the expression for insulation resistance of a Cable. **6**

   c) An average water head of 200 m is available for a hydroelectric power station operating at an overall efficiency of 80%. Calculate the volume of water required to generate one unit of electricity. **4**

P.T.O.

3. a) State and explain Kirchhoff's laws. **4**

b) Apply superposition theorem to calculate current flowing in 10 Ω resistance for the circuit shown in fig 1. **6**



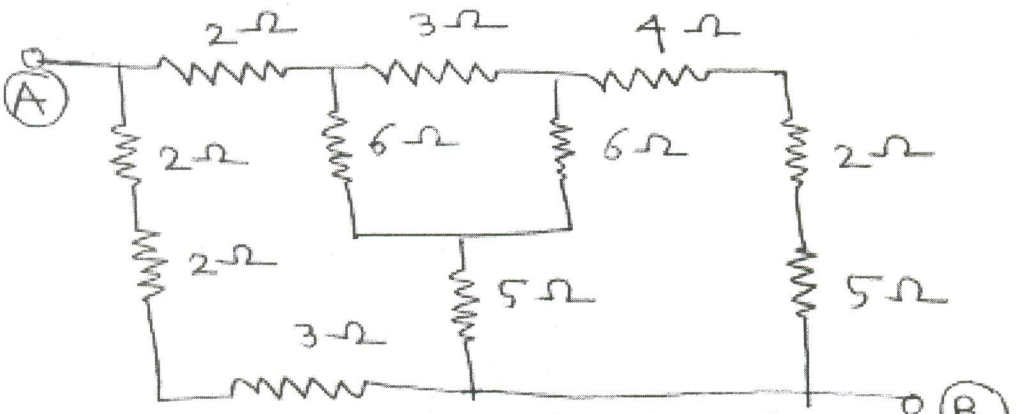

Q 3 (b) Fig (1)

c) State and explain maximum power transfer theorem. **6**

OR

4. a) State and explain Theven's theorem. **6**

b) Calculate the effective resistance between terminals (A) & (B) for the circuit shown in fig 2. **10**




Q 4 (b) Fig (2)

5. a) Define as related to Magnetic circuit
   i) Flux ii) Flux density
   iii) Magnetic field strength iv) Reluctance
   v) M.M.F. and vi) Permeability. **6**

   b) A metallic ring of uniform Cross-Section of 2 $cm^2$ and mean diameter of 20 cm is wound with 1000 turns of wire. When the coil carries a current of 01 Amp, the flux in the ring is 240 μ Wb. Calculate i) Relative permeability of the material and ii) magnetic field strength in the ring. **8**

   c) Define statically induced emf and dynamically induced emf. **4**

OR

6. a) Compare Electric circuit and Magnetic circuit. **8**

   b) Derive expression for the energy stored per unit volume in the magnetic field. **6**

   c) Explain the factors which affects the value of self inductance of the coil. **4**

SECTION – II

7. a) Derive expression for i) Average value and ii) R.M.S. value of the sinusoidally varying current in terms of peak value. **10**

   b) Derive an expression for energy stored in a capacitor. **6**

OR

8. a) Define as related to Electrostatics
   i) Electric Flux density ii) Permittivity
   iii) Dielectric strength and iv) Capacitance. **6**

   b) A sinusoidal alternating voltage has a peak value of 212.10 volt and frequency of 50 Hz. Its positive going half cycle starts at t = 0 find i) time required to attain 150 V for the first time and ii) time measured from first positive peak when voltage becomes 106 volt after passing thro′ it. **6**

   c) Define peak factor and form factor. **4**

9. a) Two impedances $Z_1 = 6 + j\ 8$ ohm and $Z_2 = 5 + j\ 12$ ohm are connected in series across a 100V, 50 Hz supply. Calculate i) P. f. of the circuit and ii) Total active, reactive and apparant power consumed. Draw relevant phasor diagram. **10**

b) A resistance of 20 Ω, a capacitor of 100 μ F and inductance of 150 mH are connected in parallel across a 100 V, 60 Hz supply. Calculate branch currents and total current drawn from supply. **8**

OR

10. a) Prove that current in a purely capacitive circuit leads the applied voltage by 90° and current in a purely inductive circuit lags the applied voltage by 90°. **10**

b) Define i) Admittance ii) Conductance and iii) Susceptance. Express them in rectangular and polar form and draw Admittance Triangle. **8**

11. a) Write short note on :

i) Losses taking place in transformer and

ii) An auto-transformer. **8**

b) Derive the relationship between the line current and phase current, line voltage and phase voltage for a three phase balanced star connected load, connected across three phase A.C. supply. Draw the relevant phasor also. **8**

OR

12. a) A three phase balanced delta connected load takes leading current of 22 Amp from a 3 phase , 440V, 50 Hz supply. The power consumed by load is 9 kW. Calculate the values of resistance and capacitance in each phase. **8**

b) A 3300 / 110 V, 50 Hz, 60 KVA single phase transformer has iron losses of 600 watt. Primary and secondary winding resistances are 3.3 ohm and 0.011 ohm respectively. Determine the efficiency of the transformer on full load at 0.8 lagging P.f. **8**

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