[4656] – 14

Seat No.	

F.E. (Semester – I) Examination, 2014
BASIC ELECTRICAL ENGINEERING
(Old) (2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or **6**, Q. No. **7** or **8**, Q. No. **9** or **10**, Q. No. **11** or **12**.*
*2) Answer to the **two** Sections must be written **separate** answer-books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of non-programmable pocket size scientific calculator is **permitted**.*
*5) **Neat** diagrams must be drawn **wherever** necessary.*
*6) Assume suitable data, **if necessary.***

SECTION – I

1. a) A + 0°C a specimen of copper wire has its resistance equal to 4 mΩ and its temp. coefficient of resistance equal to $\left[\frac{1}{234.5}\right]$ per °C. Find its resistance and temp. coefficient of resistance at 70°C and 100°C. **8**

   b) Define insulation resistance and obtain an expression for it of a single core cable. **8**

OR

2. a) If α_1 and α_2 are resist. temp. coefficients at t_1°C and t_2°C respectively then prove that

   i) $\frac{\alpha_1}{\alpha_2} = 1 + \alpha_1(t_2 - t_1)$ and

   ii) $[\alpha_1 - \alpha_2] = \alpha_1\ \alpha_2(t_2 - t_1)$ **8**

   b) An electric furnace is used in order to melt 50 Kg of tin per hour. melting temp. of tin is 235°C and room temp. is 15°C. Latent heat of fusion for tin is 13.31 KCal/Kg and specific heat of tin is 0.055 KCal/Kg °K. If input to furnace is 6 KW, find efficiency of furnace. **8**

3. a) State and explain :

   i) Kirchhoff's laws and

   ii) Thevenin's theorem. **8**

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b) Calculate current flowing in 2Ω resistance for the circuit shown in Fig. 1 using superposition theorem. **8**

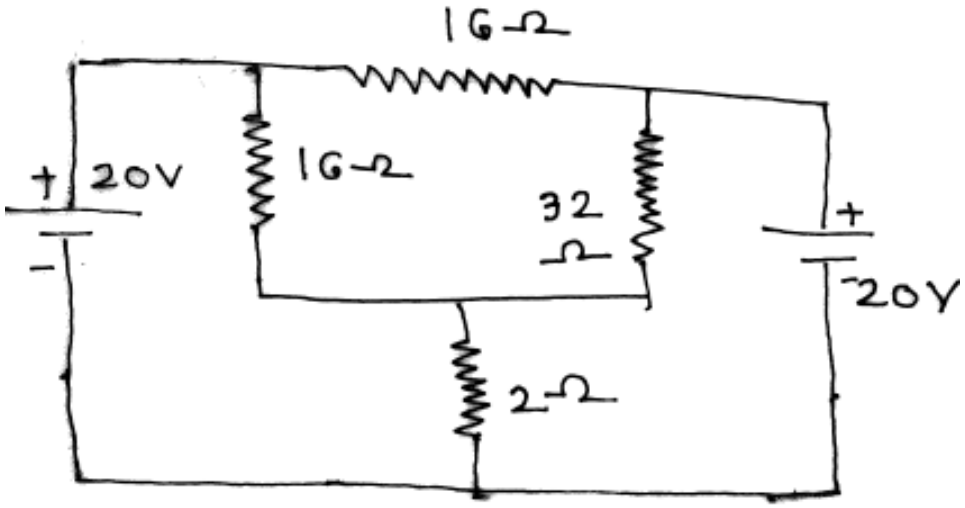

Fig. 1 Q. 3 (b)

OR

4. a) Calculate current flowing in 2Ω resistance and 32Ω resistance applying Kirchhoff's laws for the circuit shown in Fig. 1. **8**

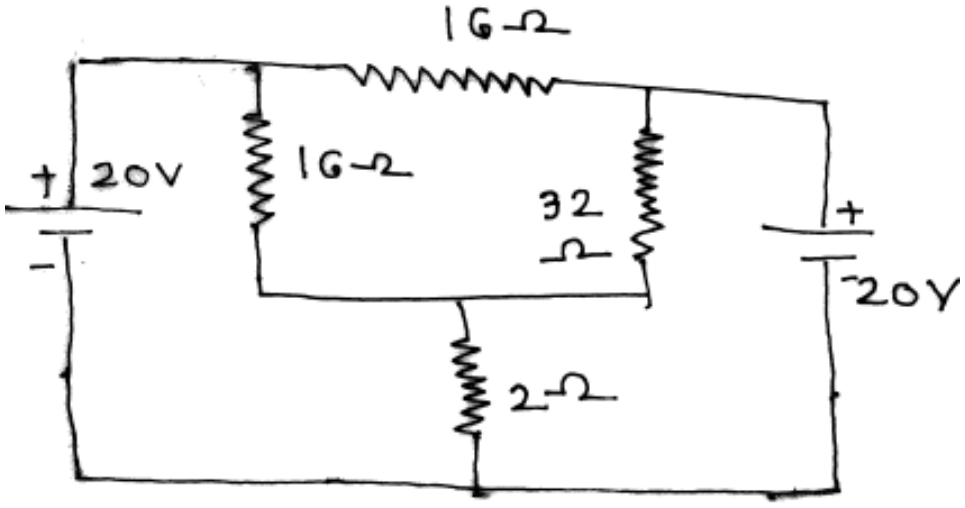

Fig. 1 Q. 4 (a)

b) Derive the formulae to convert Delta connected network into its equivalent star connected network. **8**

5. a) Define following terms and state its unit.
   i) Magnetic flux
   ii) Magnetic flux density
   iii) Permeability
   iv) Magnetic field strength and
   v) Reluctance. **10**

   b) A ring has diameter of 21 cm and cross sectional area of 10 cm^2. The ring is made up of semi-circular sections of cast iron and cast steel. Find the amp-turns required to produce flux of 8×10^{-4} wb. The relative permeabilities of cast steel and cast iron are 800 and 166 respectively. **8**

OR

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

   b) Compare electric and magnetic circuit. **6**

   c) Define :
   i) Self inductance
   ii) Mutual inductance and
   iii) Coefficient of coupling. **6**

SECTION – II

7. a) Derive the expression for energy stored in a capacitor. **6**

   b) Derive an expression for RMS value of the sinusoidally varying current in terms of peak value. **6**

   c) Sketch the following wave forms
   i) $v = 280 \sin (100\ \pi t + 90°)$ and
   ii) $i = 7.07 \sin (100\ \pi t + 30°)$. **4**

OR

8. a) At the instant t = 0, the instantaneous value of a 50 Hz sinusoidal current is 6 Amp and increases further. Its rms value is 12 Amp.
   i) Write the expression for its instantaneous value
   ii) Find the current at t = 0.01 s and t = 0.015 s and
   iii) Sketch the wave form. **8**

   b) Define as related to electrostatic
   i) Electric flux density
   ii) Permittivity
   iii) Dielectric strength and
   iv) Capacitance. **8**

9. a) When a 100 V is applied to a Coil A the current taken is 8 A and the power consumed is 120 Watt. When 100 V is applied to Coil B, the current drawn is 10 A and the power consumed is 500 Watt. Calculate the current and power when Coil A and Coil B are connected in series across 100 V supply. **10**

   b) An impedance of $(7 + j5)\,\Omega$ is connected in parallel with another impedance of $(10 - j8)\,\Omega$ across a 230 V, 50 Hz supply. Calculate i) admittance, conductance and suceptance of the combined circuit ii) total current and p.f. **8**

OR

10. a) A series circuit consisting of $25\,\Omega$ resistor, 64 mH inductor and 80 μF capacitor is connected to a 110 V, 50 Hz single phase supply. Calculate the current, voltage across each element and over all p.f. of the circuit and draw the phasor diagram. **10**

    b) A parallel circuit consist of two branches. Branch i) consist of R of $100\,\Omega$ connected in series with inductance of 1 H and branch ii) consist of R of $50\,\Omega$ in series with capacitance of 79.5 μF. This parallel circuit is connected across single phase 200 V, 50 Hz supply. Calculate
    i) Branch currents and total current drawn by circuit and
    ii) Total power consumed by circuit. **8**

11. a) Write short note on :
    i) Losses taking place in transformer and
    ii) Auto transformer. **12**

    b) Define :
    i) Phase sequence and
    ii) Balanced load as referred to polyphase circuits. **4**

OR

12. a) Three coils each with resist. of $12\,\Omega$ an inductive reactance of $5\,\Omega$ are connected in star across 3 phase 400 V 50 Hz supply. Calculate power consumed. If same coils are then connected in delta then calculate the total power consumed. **12**

    b) Differentiate core type and shell type transformer. **4**

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