Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. Sem-I/II Examination June-July 2011

Subject code: 110005 **Subject Name: Element of Electrical Engineering**
Date: 28/06/11 **Total Marks: 70** **Time: 10:30 am to 1:00pm**
Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain the factors affecting the resistance of a conducting material. **03**

(b) An alternating voltage of v = 100sin(376.8 t) is applied to a coil having resistance 6 Ω and inductance of 21.22 mH. **05**
Determine (i) Current through the coil
(ii) Power dissipated in the coil

(c) The waveform for instantaneous power in ac circuit is resolved into two component, i.e. $p(t)=p_1(t)+p_2(t)$. Plots of both components are shown in fig no1 . Calculate magnitude of total real power and magnitude of total reactive power (write unit also). **06**

Q.2 **(a)** Explain charging and discharging of a capacitor, C, through a resistor, R, with neat sketch and derive the equation $V_c = V (1- e^{-t/RC})$. Assume that the R-C series circuit is connected across a d.c supply of voltage V. **07**

(b) A parallel plate capacitor has plates of area 2 m^2 spaced by three slabs of different materials .The relative permittivity are 2,3 and 6 and thickness are 0.4, 0.6 and 1.2 mm respectively. Calculate the equivalent capacitance and electric stress in each material when the applied voltage is 1000 V. **07**

OR

(b) A ring has a mean diameter of 21 cm and a cross sectional area of 10 cm^2. The ring is made up of semi circular sections of cast iron and cast steel, with joint having reluctance equal to an air gap of 0.2 mm. Find the amp-turns required to produce a flux of 8 X 10^{-4} wb. The relative permeability of cast steel and cast iron are 800 and 166 respectively. Neglect fringing and leakage effect **07**

Q.3 **(a)** State and explain self inductance (L). Derive expression of co-efficient of mutual coupling between two coils having self inductances of L_1 and L_2. **06**

(b) Explain magnetic hysteresis **04**

(c) Prove that the average power consumption in a pure inductive or capacitive circuit is zero. **04**

OR

Q.3 **(a)** A balanced three phase supply is given to a star connected load. Give proof of two wattmeter method for this system. State demerits of this method. **06**

(b) Derive the equation of energy stored in a magnetic field. **04**

(c) An alternating current having an equation I =141.4sin314t. **04**

Find: (i)Frequency (ii)R.M.S. Value (iii)Average Value (iv) An instantaneous value of current when ' t' is 2 ms.

Q.4 **(a)** State and Explain plate and pipe earthling with neat diagram. **07**

(b) General guideline for wiring of domestic installation with neat sketch for position of equipment. **07**

OR

Q.4 **(a)** Explain with diagram different types of illumination scheme. **07**

(b) Explain with neat sketch construction and working of lead acid battery **07**

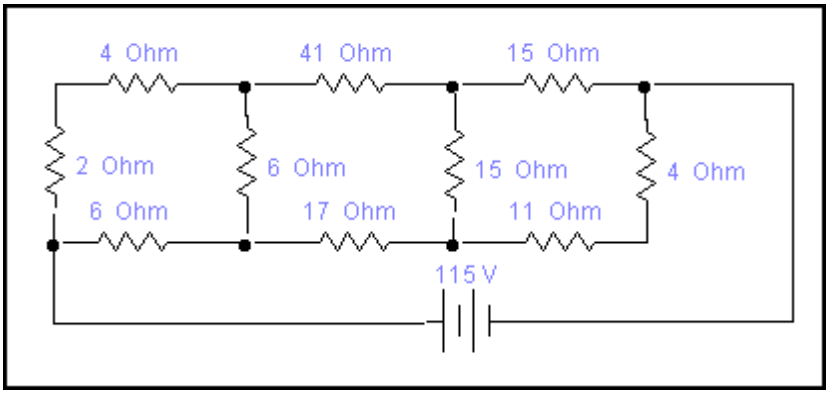
Q.5 **(a)** Explain with neat sketch general construction of cable. **05**

(b) With necessary diagram derive the formula for star to delta and delta to star transformation. **05**

(c) A balanced three phase power supply is connected to a balanced load. Derive the expression of instantaneous power of phase A , pa(t). Obtain expression of p(t), where p(t) is summation of instantaneous powers of all three phases. assume that $v_a(t)=V_m \sin\omega t$ and $i_a(t)=I_m \sin(\omega t-\Phi)$. **04**

OR

Q.5 **(a)** Determine the current in 17 Ω resistor in the network shown in Figure **07**



(b) Give comparison of series and parallel resonance in R-L-C A.C circuit. Derive expression of quality factor, Q for series R-L-C circuit. **07**

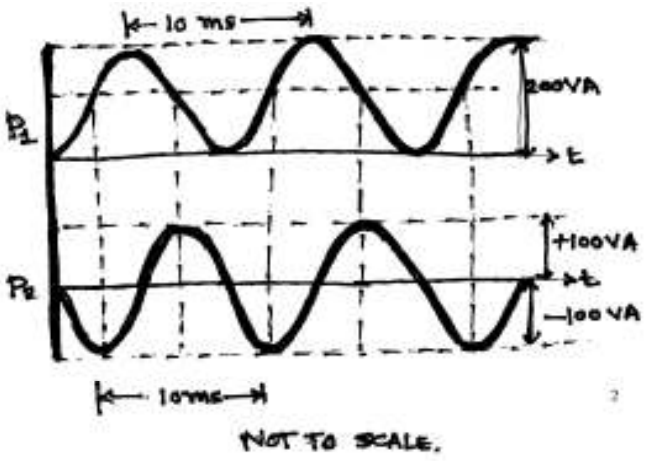


Figure 1

****