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

(c) The waveform for instantaneous power in ac circuit is resolved into   **06**
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).

Q.2 **(a)** Explain charging and discharging of a capacitor, C, through a resistor,   **07**
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.

(b) A parallel plate capacitor has plates of area 2 m^2 spaced by three slabs   **07**
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.

OR

(b) A ring has a mean diameter of 21 cm and a cross sectional area of 10   **07**
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

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

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

OR

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

(b) Derive the equation of energy stored in a magnetic field.   **04**
(c) An alternating current having an equation I =141.4sin314t.   **04**

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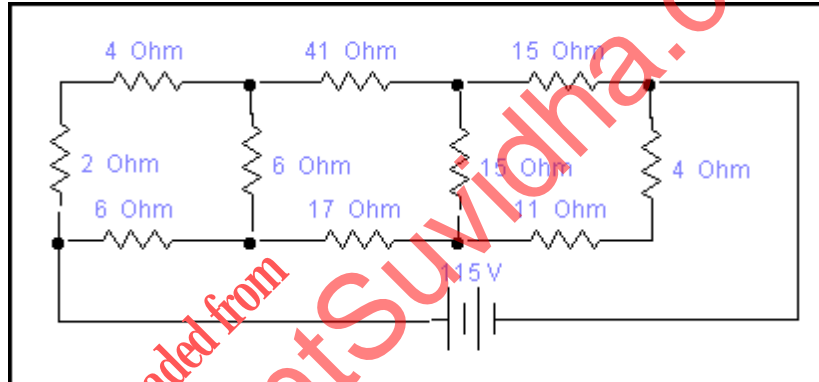
(b) Give comparison of series and parallel resonance in R-L-C A.C circuit. Derive expression of quality factor, Q for series R-L-C circuit. **07**
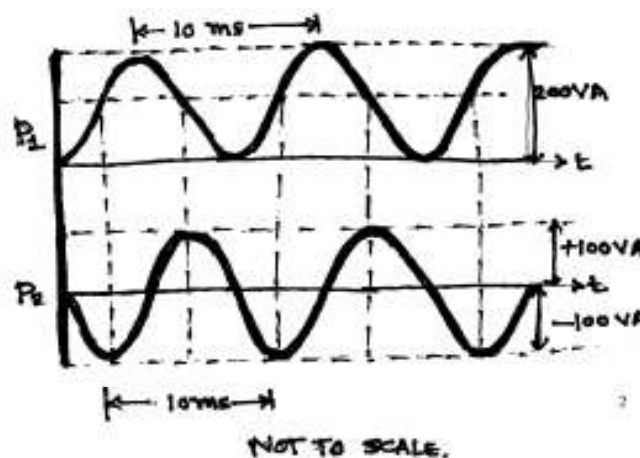

Figure 1
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