

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-II Examination June- 2010****Subject code: 110005****Subject Name: Elements of Electrical Engineering****Date: 19 / 06 / 2010****Time: 02.30 pm – 05.00 pm****Total Marks: 70****Instructions:**

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

- Q.1**
- (a) Find the resistance between the terminals A and B in the network shown in the Fig. 1. **06**
- (b) A carbon colour coded resistor has first ring of orange, second of blue, third of red and fourth of golden colour. Find the specifications of the resistor. **02**
- (C) Define temperature co-efficient of resistance. How does the resistance of different materials vary with temperature? **06**
 Prove that $\alpha_t = \alpha_0 / (1 + \alpha_0 t)$ and $\alpha_2 = 1 / [(1 / \alpha_1) + (t_2 - t_1)]$
- Q.2**
- (a) (i) Give the circuit diagram of ELCB. Explain its working and applications. **04**
 (ii) Discuss any one method of earthing. **03**
- (b) In the RC circuit shown in the Fig. 2, $R = 2 \text{ M}\Omega$ and $C = 5 \mu\text{F}$. The capacitor is charged to an initial potential of 50 V, when the switch is closed at $t = 0+$. Calculate **07**
1. Initial rate of charging of the capacitor voltage.
 2. Capacitor voltage after time = 5λ seconds.
- If the polarity of the capacitor voltage is reversed, calculate,
3. The values of the above quantities.
 4. Time taken for V_c to reach -10 V, 0V and 95 V.
- OR**
- (b) Two square conducting plates having a cross sectional area of 2500 cm^2 and 1 cm distance between them are connected across a 600 V supply voltage. They have a dielectric, 0.8 cm thick having a relative permittivity of 4 between them. The remaining space is filled with air. Calculate the capacitance of the condenser and the energy stored in it. **07**
- Q.3**
- (a) Describe "Ceramic Capacitors". **03**
- (b) An iron ring of 40cm mean diameter and a cross section of 3 cm diameter, has an air gap of 2 mm. It is uniformly wound with 750 turns of wire and carries a current of 3 A. The iron path takes 60 % of the total mmf. Neglect magnetic leakage. Find the total mmf, magnetic flux, reluctance and flux density in the ring. **05**
- (C) Discuss the forces acting between two parallel current carrying conductors. **06**
- OR**
- Q.3**
- (a) Compare electrical circuit with magnetic circuit. **03**
- (b) Derive the equation for the co-efficient of coupling of two magnetically coupled coils A and B. **05**
- (c) Two coils having 200 and 100 turns respectively are wound side by side on a closed iron circuit of cross section 140 cm^2 and mean length of flux path 135 cm. The current in the first coil increases steadily from 0 to 7 A in 5 milliseconds. Assume the co-efficient of coupling equal to 1 and the permeability of iron equal to 1800. Find the self inductance of each coil and the induced emf in the second coil. **06**

- Q.4 (a)** A series RLC circuit consists of a resistance of 500Ω , inductance of 50mH and a capacitance of 20pF . Find **05**
1. The resonant frequency.
 2. The Q-factor of the circuit at resonance.
 3. The half power frequency.
- (b)** Discuss different methods of representation of vector quantities. **03**
- (c)** Calculate the RMS and average value of the sinusoidal waveform shown in the **Fig.3** From them, find the peak factor and form factor. **06**

OR

- Q.4 (a)** Discuss how the inductance of a choke coil can be measured using a rheostat, a voltmeter and an ammeter. **04**
- (b)** Derive the equation of power in a single phase AC circuit in vector form only. **02**
- (c)** In a series parallel circuit, the parallel branches 'A' and 'B' are in series with branch 'C'. The impedances are $Z_A = (4+j3) \Omega$, $Z_B = (4-j16/3) \Omega$ and $Z_C = (2+j8) \Omega$. If the current $I_c = (25+j0) \text{ Amp.}$, determine the branch currents and voltages and the total voltage. Hence calculate the complex power (the active and reactive powers) for each branch and the whole circuit. **08**

- Q.5 (a)** Three identical coils each of $(4.2 +j5.6) \Omega$ are connected in star across a 415 V , 3 phase, 50 Hz AC supply. Find **05**
1. Phase voltage.
 2. Phase current.
 3. Readings of two wattmeter's W_1 and W_2 when they are connected to measure the total power.
- (b)** Discuss staircase wiring. **03**
- (c)** 1. Discuss electrical characteristics of batteries. **04**
2. Give connection diagram of a battery charging circuit **02**

OR

- Q.5 (a)** A delta connected load having branch impedances of $(15 +j20) \Omega$ is connected to a 220V , 3 phase AC supply. Find **05**
1. Line currents.
 2. Per phase power consumed.
 3. What is the phasor sum of the line currents? Why does it have this value?
- (b)** Draw the connection diagram of a tube light and explain its starting and working. **04**
- (c)** Explain the construction of a three phase cable. **05**

