Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 1st / 2nd • EXAMINATION – WINTER 2013

Subject Code: 110005 Date: 24-12-2013

Subject Name: Elements of Electrical Engineering

Time: 10:30 am – 01:00 pm Total Marks: 70

Instructions:

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

Q.1 **(a)** Give comparison of series and parallel circuit. **07**
Why are domestic appliances connected in parallel?

(b) What is the temperature co-efficient of resistance? **07**
Prove $Rt_2 = Rt_1 [1 + \alpha_1 (t_2-t_1)]$, where notations have usual meanings.

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) Find the current supplied by the battery using Kirchhoff's law in Fig.1. **07**

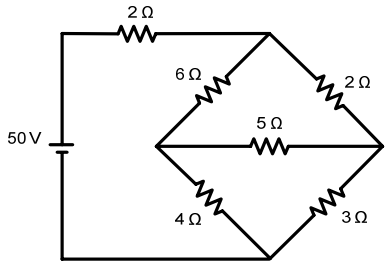

Fig.1

OR

(b) Explain the method of transforming a star network of resistances into delta Network. **07**

Q.3 **(a)** Explain the method of measuring 3-Φ power by two watt meters **07**

(b) State similarities and dissimilarities between electric circuit and magnetic circuit. **07**

OR

Q.3 **(a)** Explain hysteresis loss and eddy current loss. Also state the remedies to reduce these losses. **07**

(b) Obtain the relation $L = (L_1L_2 – M^2) / (L_1+L_2+2M)$ for equivalent inductance when two inductors are connected in parallel such that the mutually induced emf opposes the self induced emf. **07**

Q.4 **(a)** Define following terms with respect to a.c. waveform **07**
(i) Frequency (ii) Power factor (iii) R.M.S. value (iv) Amplitude
(v) Average value (vi) Instantaneous value. (vii) Time period

(b) Four currents are meeting at a point in a circuit. Find the resultant current. **07**
$i_1 = 5 \sin \omega t$, $i_2 = 10 \sin (\omega t-30°)$, $i_3 = 5 \cos (\omega t- \omega t-30°)$, $i_4 = -10 \sin (\omega t+45°)$

Q.5 **(a)** Prove that current in purely inductive circuit lags its voltage by 90° and average power consumption in pure inductor is zero. **07**

(b) The voltage and current in a circuit are given by $V = 150\angle 30°$ volt and **07**

I = 2∠-15° Ampere. If circuit works on a 50 Hz supply, determine,
(i) Impedance, (ii) Resistance, (iii) Reactance, (iv) Power factor, (v) Power loss

Q.6	**(a)**	Explain with neat sketch construction and working of lead acid battery	**07**
	(b)	Derive an expression for the total power for a balanced 3 phase star connected load in terms of line voltage, line current and power factor.	**07**
Q.7	**(a)**	Classify and explain various types of lighting schemes.	**07**
	(b)	Explain the working of earth leakage circuit breaker with diagram.	**07**

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