Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY PDDC - SEMESTER-I EXAMINATION – WINTER 2015

Subject Code: X10901 Subject Name: Elements of Electrical Engineering Time: 10:30am to 01:00pm Instructions:

- 1. Attempt any five questions.
 - 2. Make suitable assumptions wherever necessary.
 - 3. Figures to the right indicate full marks.
- Q.1 (a) Define temperature coefficient of resistance and derive following expression for 07 conducting materials:

$$\boldsymbol{\alpha}_t = \frac{\boldsymbol{\alpha}_0}{1 + \boldsymbol{\alpha}_0 t}$$

where notations have their usual meaning.

(b) Determine equivalent resistance between points X and Y using star-delta 07 transformation.

- Q.2 (a) What is capacitance? With usual notations derive an expression for capacitance 07 of composite dielectrics having three different dielectrics kept in parallel plate configuration.
 - (b) A capacitor of 2 μ F capacitance charged to potential difference of 200 V is discharged through a resistor of 2 M Ω . Calculate (i)Initial value of discharging current (ii) and the discharging current magnitude 4 seconds late.
- Q.3 (a) State principle of electromagnetic induction. Explain statically and dynamically 07 induced emf with example.
 - (b) When two coils A and B are connected in series cumulatively has total inductance of 0.5 H. When they are connected in series differentially, the resultant inductance is 0.2 H. If coil B has a self-inductance of 0.15 H, calculate the self-inductance of coil A and the induced emf in coil B when the rate of decrease of current in series circuit combination is 1000 A/s. Also find coefficient of coupling.
- Q.4 (a) Define RMS value and form factor for sinusiodally varying of current. Prove 07 analytically that RMS value of sinusiodally varying current is $\frac{1}{\sqrt{2}}$ times its maximum value.



Date: 28/12/2015

Total Marks: 70

- (b) A series RLC circuit is connected to 230 V AC supply. The current drawn in the circuit at resonance is 25 A. The voltage drop across the capacitor is 4000 V at the resonance condition. Calculate resistance, inductance and resonance frequency if capacitance is 5 μ F.
- Q.5 (a) Describe three phase power measurement with two wattmeter technique with 07 circuit diagram and phasor diagram.
 - (b) The power taken by a 3-phase, 415 V, delta-connected motor is measured by two – wattmeter method and readings of two wattmeters are 3 kW and 1 kW respectively. Determine (i) power factor and (ii) line current of the motor.
- Q.6 (a) A direct current of 2 A is passed through a coil of 2000 turns and produces a flux of 0.2 mWb. Assuming that whole of flux links with all turns, then what is the inductance of the coil? Find voltage developed across the coil if current is interrupted in 1 ms.
 - (b) Derive an expression of equivalent inductance when two coils are connected in parallel with their fluxes acting in the same direction.
- Q.7 (a) Discuss AC parallel resonance circuit (pure capacitor in parallel with the series or combination of resistance and inductance) with derivation of resonance frequency expression using phasor diagram.
 - (b) Derive transformation of delta-connected resistances into equivalent star- 07 connected resistances with usual notations.
