Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

P.D.D.C. Sem- I Examination January 2010

Subject code: X10901

Subject Name: Elements of Electrical Engineering

Date: 06 / 01/ 2010 **Time: 11.00 am – 1.30 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)**	State and explain factors affecting resistance of a conductor.	**07**
	(b)	Explain Specific resistance and temperature coefficient of resistance.	**04**
	(c)	A lamp rated 100V, 75 W is to be connected across 230 V supply. Find the value of resistance to be connected in series with the lamp. Also find the power loss occurring in the resistance.	**03**
Q.2	**(a)**	State and explain KCL and KVL.	**07**
	(b)	Derive the expression for the equivalent capacitance of a group of capacitors when they are connected in (1) series and connected in (2) parallel.	**07**
		OR	
	(b)	State and explain laws of electrostatics. Also explain Electric field intensity.	**07**
Q.3	**(a)**	Define the following with respect to AC quantity: (1) Phase Difference (2) Frequency (3) Form Factor	**03**
	(b)	Prove analytically that the current in a purely Inductive circuit lags behind its voltage by 90° and average power consumption is zero when alternating voltage is applied.	**07**
	(c)	Three currents are represented by $i_1 = 10 \sin\omega t$ $i_2 = 20 \sin\left(\omega t - \frac{\pi}{6}\right)$ $i_3 = 30 \sin\left(\omega t + \frac{\pi}{4}\right)$ Find the magnitude and phase angle of the resultant current.	**04**
		OR	
Q.3	**(a)**	Define the following with respect to AC quantity: (1) Amplitude (2) Instantaneous value (3) Peak factor.	**03**
	(b)	With graphical representation explain series R-L-C resonance.	**07**
	(c)	Find the current in Z_1 and Z_2 respectively when they are connected in parallel and supplied by 230 volts rms. Also find total current drawn and power factor. $Z_1 = 3 + j\,4\ \Omega$ $Z_2 = 3 - j\,4\ \Omega$	**04**
Q.4	**(a)**	Define the following with respect to AC quantity: (1) Amplitude (2) Instantaneous value (3) Peak factor.	**03**
	(b)	Discuss similarities and dissimilarities between Electric circuit and Magnetic circuit.	**04**
	(c)	Explain Dynamically induced e.m.f and Statically induced e.m.f.	**07**
		OR	
Q.4	**(a)**	Define following terms with respect to magnetic circuit: (1) Leakage coefficient (2) Fringing effect (3) Permeability	**03**
	(b)	Explain with suitable diagram, how Hysteresis loop can be obtained?	**04**
		State and explain laws of electromagnetic induction and also state the rule which determines the direction of the induced e.m.f.	**07**
Q.5	**(a)**	Derive the relationship of phase quantity and line quantity in case of Star connection in 3-phase circuit.	**07**

(b) A 415V, 3-phase voltage is applied to a balanced star-connection connected to 3-phase load of phase impedance (3 + j 4) ohms each. Calculate (i) Line current (ii) Total power supplied. **07**

OR

Q.5 **(a)** Explain the method of measuring power in 3-phase circuit by two wattmeter method. **07**

(b) Three similar coils each of resistance 15 Ω and inductance of 0.25 H are connected (i) in Star and (ii) in Delta to a 3-phase, 400V, and 50 Hz supply. Calculate line and phase values of current in both the cases. Also calculate the power absorbed. **07**

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