Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem- 1st Regular Examination January 2011

Subject code: 110005

Subject Name: Elements of Electrical Engineering

Date: 07/ 01 /2011 **Time: 10.30 am - 01.00 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) Three resistances R_{ab}, R_{bc} and R_{ca} are connected in star. Obtain their equivalent for delta resistances. **08**

(b) A 100V, 60W bulb is connected in series with a 100V, 100W bulb and the combination is connected across the 200V mains. Find the values of resistance that should be connected across the first bulb, so that each bulb may get proper current at the proper voltage. **06**

Q.2 (a) Compare electric circuit and magnetic circuit by their similarities and dissimilarities. **07**

(b) Derive an expression for the energy stored in an inductor of self inductance 'L' henry carrying the current of 'I' amperes. **07**

OR

(b) A mild steel ring of 30 cm mean circumference has a cross-sectional area of 6 cm^2 and has a winding of 500 turns on it. The ring is cut through at a point so as to provide an air-gap of 1 mm in the magnetic circuit. It is found that a current of 4 A in the winding, produces a flux density of 1 T in the air-gap. Find (i) the relative permeability of the mild steel and (ii) inductance of the winding. $\left(\mu_0 = 4\pi \times 10^{-7}\right)$ **07**

Q.3 (a) State coulomb's law of electrostatics. **02**

(b) Define capacitance. Derive an expression for the total capacitance of a group of capacitance when (i) they are connected in series (ii) they are connected in parallel. **06**

(c) A series combination having R = 2 M Ω and C = 0.01 μF is connected across d.c. voltage source of 50V. Determine capacitor voltage and charging current after 0.02 s, 0.04 s and 0.06 s. **06**

OR

Q.3 (a) Explain the variations of watt-meter readings for 3-phase power measurement by two watt-meter method as power factor takes the values of unity, 0.5, between 0.5 & 0 and 0. **07**

(b) A 3-phase load consists of three similar inductive coils of resistances of 50 Ω and inductance 0.3 H. The supply is 415 V 50 Hz. Calculate:(i) the line current (ii)the power factor and the total power when the load is star connected. **07**

Q.4 (a) Explain with the aid of a phasor diagram the phenomenon of resonance in a circuit containing an inductor, a capacitor and a resistor in series. **07**

(b) A circuit consists of a 4 μF capacitor in parallel with a coil of resistance 40 Ω and inductance 0.25 H. If the voltage applied to the circuit at resonance frequency is 230 V, calculate the current in each branch, supply current and the current magnification. **07**

OR

Q.4 (a) Distinguish between (i) apparent power (ii) active power and (iii) reactive power. **03**

(b) Prove that average power consumption in pure inductor is zero when a.c. voltage is applied. **06**

(c) A capacitor of 100 μF is connected across a 200V, 50Hz single phase supply. Calculate (i) the reactance of the capacitor (ii) r.m.s. value of current and (iii) the maximum current. **05**

Q.5 (a) Name various types of wiring systems commonly used in and explain any one of them in detail. **07**

(b) State and explain different illumination schemes used for domestic purpose. **07**

OR

Q.5 (a) Briefly discuss following terms: **08**

(i) Luminious Flux (ii) Luminious intensity

(iii) ILLumination (iv) Luminance

(b) With help of diagram explain working of Earth Leakage Circuit Breaker (ELCB). **06**