Seat No.: _____   Enrolment No._____

(EE-8)
GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. all Sem-I Examination December 08/January 09

Elements of Electrical Engineering (110005)

DATE: 31-12-2008, Wednesday   TIME: 12.00 to 2.30 p.m.   MAX. MARKS: 70
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Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Symbols have their usual meanings.**

Q.1

(a) Define temperature co-efficient of resistance. How resistances of different materials vary with temperature? Prove that $\alpha_t = \alpha_0/(1 + \alpha_0 t)$ **08**

(b) Explain the following terms: (i) Magnetomotive force (ii) Magnetic field Intensity (iii) Reluctance   **06**

Q.2

(a) Derive the expression for the voltage across the capacitor at any instant after the application of **dc** voltage **V** to a circuit having a capacitance **C** in series with resistance **R**.   **07**

(b) An iron ring having a cross sectional area of 5**cm** $\times$ 4**cm** and a mean diameter of 18 **cm** has a coil of 270 turns uniformly wound over it. A current of 1.27 **A** flows through the coil which produces a flux of 1.13 **mWb** in the ring. Find the reluctance of the circuit, the absolute and relative permeabilities of iron   **07**

OR

(b) Two inductive coils are connected in parallel. Derive the expression for total inductance when (i) coils are in parallel aiding connection (ii) coils are in parallel opposing connection   **07**

Q.3

(a) Explain the method of transforming a star network of resistances into delta network and vice versa.   **09**

(b) For the network shown in *figure* **1**, determine the current supplied by the battery using star-delta transformation.(All resistances are in **ohms**)   **05**
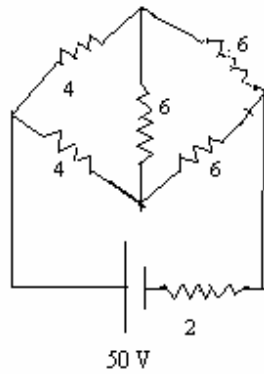
figure 1
OR

Q.3

(a) Define (i) form factor (ii) peak factor. Obtain the **rms** value and average value of half wave rectified sinusoidal voltage wave. **08**

(b) Three currents are represented by $i_1 = 10\sin\omega t$; $i_2 = 20\sin(\omega t - \pi/6)$; $i_3 = 30\sin(\omega t + \pi/4)$. Find magnitude and phase angle of resultant current. **04**

(c) A certain waveform has a form factor of 1.2 and a peak factor of 1.5. If the maximum value is 100, find rms value and average value. **02**

Q.4

(a) Discuss resonance in R-L-C series circuit. Explain how pf, X_L and R vary with frequency. **10**

(b) Define power factor. What is the power factor of a pure inductor? Give the difference between active and reactive power. **04**

OR

Q.4

(a) Prove that power in a 3-phase balanced circuit can be deduced from the readings of two wattmeters. Draw the relevant connection and phasor diagrams. Discuss the nature of power factor (i) when two readings are equal and positive (ii) when two readings are equal but opposite in sign (iii) when one wattmeter reads zero. **10**

(b) Three similar coils each of resistance 28Ω and inductance 0.7H are connected in (i) star (ii) delta. If the supply voltage is 230V, 50Hz, calculate the line current and total power absorbed. **04**

Q.5

(a) Explain the following methods of charging a battery (i) Constant current method (ii) Constant voltage method **06**

(b) Classify and explain various types of lighting schemes. **06**

(c) What is the function of fuse in an electrical circuit? State the desirable properties of fuse element. **02**

OR

Q.5

(a) Explain the wiring diagram of a tubelight with choke and glow starter. **07**

(b) State the different methods of earthing and explain **any one** of them. **07**

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