

**GUJARAT TECHNOLOGICAL UNIVERSITY****P.D.D.C. Sem- I Remedial Examination March / April 2010****Subject code: X10901****Subject Name: Elements of Electrical Engineering****Date: 05 / 04 / 2010****Time: 12.00 noon – 02.30 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) With proper circuit diagrams state and explain Kirchhoff's laws. **07**  
(b) A coil has a resistance of  $20\Omega$  when its mean temperature is  $20^\circ\text{C}$  and of  $23\Omega$  when its mean temperature is  $50^\circ\text{C}$ . Determine its mean temperature rise when its resistance is  $24\Omega$  and the surrounding temperature is  $15^\circ\text{C}$ . **07**

- Q.2** (a) Explain charging process of a capacitor. **07**  
(b) Discuss various similarities and differences in detail between an electric circuit and a magnetic circuit. **07**

**OR**

- (b) Explain resonance in a.c. series circuit. **07**

- Q.3** (a) Explain the terms: (i) m.m.f. (ii) permeability **04**  
(b) State and explain Lenz's law **04**  
(c) A circular iron ring has a cross sectional area of  $15\text{ cm}^2$  and a mean length of  $6\pi\text{ cm}$  in iron has an air gap of  $0.6\pi\text{ mm}$  made by a saw cut. The relative permeability of iron is 1300 and the permeability of free space is  $4\pi \times 10^{-7}\text{ H/m}$ . The ring is wound with a coil of 2400 turns and carries 4 mA current. Find the air gap flux neglecting leakage and fringing. **06**

**OR**

- Q.3** (a) Derive the equation for equivalent inductance of two inductances connected in series with subtractive polarity connection. **04**  
(b) Briefly discuss the concept of magnetic hysteresis. **04**  
(c) Two coils, A of 1000 turns and B of 1250 turns, lie in parallel planes such that 70% of the flux produced by coil A links with coil B. A current of 3 A produces a flux of 0.04 mWb in coil A. The same current produces a flux of 0.06 mWb in coil B. Find (1) The mutual inductance between the coils. (2) The co-efficient of coupling. **06**

- Q.4** (a) Define: (1) Frequency (2) phase difference **07**  
(3) average value (4) Time period  
(5) active power (6) power factor  
(7) impedance  
(b) Determine form factor for a semicircular current wave which has a peak value of 'a'. **07**

**OR**

- Q.4** (a) Define the term (1) Reactance, (2) inductive reactance and (3) capacitive reactance and discuss how they depend on frequency in ac circuits. **07**

- (b) A series RLC circuit having resistance of  $10\ \Omega$ , inductance of 100 mH and capacitance of 100 micro farad is connected across 200 V, 50Hz ac supply. Determine: (a) the current , (b) the power factor and (c) the voltage drops across all three elements. **07**

**Q.5 (a)** Define line voltage and phase voltage. Derive voltage and current relationship for a 3 phase star connection. **07**

- (b) Explain with suitable waveform and vector diagram , the generation of three phase EMF. **07**

**OR**

**Q.5 (a)** Explain method of measurement of power in a three phase balanced circuit with the help of two watt meters. **07**

- (b) Discuss advantages of poly phase system over single phase system. **07**

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