GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. Sem-II Remedial Examination September 2009

Subject code: 110005
Subject Name: Elements of Electrical Engineering

Date: 10/09/2009   **Time: 03:00pm-5:30pm**

Total Marks: 70

Instructions:
1. **Write seat no. and enrolment no. at given location on question paper.**
2. **Attempt all questions.**
3. **Make suitable assumptions wherever necessary.**
4. **Figures to the right indicate full marks.**

Q.1

(a) State and explain Kirchhoff's laws. **05**

(b) Compare magnetic and electric circuits. **05**

(c) Explain self induced e.m.f. and mutually induced e.m.f. **04**

Q.2

(a) What is capacitor? Derive the expression for the equivalent capacitance of capacitors connected (i) in parallel (ii) in series. **07**

(b) A 2 µF capacitor is connected by closing a switch to a supply of 100 volts through 1 MΩ series resistance. Calculate (i) time constant (ii) initial charging current (iii) the initial rate of rise of voltage across capacitor (iv) voltage across the capacitor 6 seconds after the switch has been closed. **07**

OR

(b) An iron ring of cross sectional area 6 cm^2 is wound with a wire of 100 turns and has a saw cut of 2 mm. Calculate the magnetizing current required to produce a flux of 0.1 mWb if the mean length of magnetic path is 30 cm and relative permeability of iron is 470. Neglect leakage. **07**

Q.3

(a) What is coefficient of coupling? Derive expression for the same between two magnetically coupled coils. **08**

(b) The field winding of a generator has a resistance of 12.7 Ω at 18°C and 14.3Ω at 50°C. Find:
    (i)   temperature coefficient of resistance at 0°C
    (ii)   resistance at 0°C
    (iii)   temperature coefficient at 18°C **06**

OR

Q.3

(a) Prove that in a purely capacitive circuit power consumed is zero when a.c. voltage is applied. Draw relavent phasor diagram and waveforms. **08**

(b) An alternating current varying sinusoidally with a frequency of 50 Hz has r.m.s. value of 10A. Write down the equation for instantaneous value and find this value (i) 0.0025 second and (ii) 0.0125 second after passing through a positive maximum value. **06**

Q.4

(a) An inductive coil of resistance R and inductance L is connected in parallel with a capacitor of C. Derive an expression for resonant **08**

frequency and Q factor.

(b) A resistor of 40Ω and an inductor of 0.2 H and capacitor of 120 µF **06**
are connected in parallel across 230V,50 Hz supply.
Find:
(i) the current of each branch (ii) the resultant current (iii) power
factor of the circuit.

OR

Q. 4

(a) Establish relationship between line and phase voltages and currents **08**
in balanced delta connection. Draw complete phasor diagram of
voltages and currents.

(b) Three identical coil each having resistance of 10 Ω and reactance of **06**
10 Ω are connected in (i) star and (ii) delta across 400V, 3 phase
supply. Find in each case line current and the reading of each of the
two watt meters connected to measure the power.

Q.5

(a) Explain the working of earth leakage circuit breaker with diagram. **06**
(b) Explain the following wiring systems **06**
(i) Cleat wiring (ii) conduit wring
(c) What do you mean by **02**
(i) Ampere hour efficiency and (ii) Watt-hour efficiency of a battery

OR

Q.5

(a) Discuss the considerations for the design of lighting scheme **06**
(b) Explain construction and working of high pressure mercury vapor **04**
lamp.
(c) Explain the working of a miniature circuit breaker. **04**

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