

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B. E. - SEMESTER – I • EXAMINATION – WINTER • 2014**

**Subject code: 110005****Date: 07-01-2015****Subject Name: Elements of Electrical Engineering****Time: 10:30 am - 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain KCL and KVL. Explain that why are domestic appliances connected in parallel? **07**
- (b) Derive the equation of Star to Delta and Delta to Star transformation. **07**
- Q.2** (a) Derive an expression for the voltage across the capacitor during charging through the resistor at any instant  $V_c = V (1 - e^{-t/\lambda})$  where  $V$  is the battery source voltage and  $\lambda$  is the time constant of the circuit. **07**
- (b) A 10  $\mu$ F capacitor in series with an 1 M $\Omega$  resistor is connected across a 100 V supply. Determine **07**
- (a) The time constant of the circuit.
- (b) The initial value of charging current.
- (c) Initial rate of rise of voltage across the capacitor.
- (d) The capacitor voltage after a time equal to the time constant.
- (e) The circuit current at this time.
- (f) Voltage across the capacitor 3 sec after switch on.
- (g) The time taken for the capacitor voltage to reach 50V.
- Q.3** (a) State similarities and dissimilarities between electric circuit and magnetic circuit. **07**
- (b) A circular iron ring has a cross sectional area of 15 cm<sup>2</sup> and a mean length of 18.84 cm in iron, has an air gap of 1.884 mm made by a saw cut. The relative permeability of iron is 1300 and the permeability of free space is  $4\pi \times 10^{-7}$  H/m. The ring is wound with a coil of 1200 turns and carries 8mA current. Find the air gap flux neglecting leakage and fringing. **07**
- Q.4** (a) Define following terms with respect to a.c. waveform **07**
- (i) R.M.S. value (ii) Power factor (iii) Amplitude (iv) Form Factor (v) Phase (vi) Frequency (vii) Average value
- (b) 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**
- Q.5** (a) Explain the method of measuring 3- $\Phi$  power by two wattmeters. **07**
- (b) Prove that average power consumption in pure inductor is zero when a.c. voltage is applied. **07**
- Q.6** (a) Draw & explain staircase wiring with necessary sketch. **07**
- (b) What is the construction of three core cable? Explain each parts and its importance. **07**
- Q.7** (a) Explain the working of earth leakage circuit breaker (ELCB) with diagram. **07**
- (b) Explain the types of lighting schemes with suitable diagrams. **07**

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