

**GUJARAT TECHNOLOGICAL UNIVERSITY**

B.E. Sem-I &amp; II Remedial Examination Nov/ Dec. 2010

**Subject code: 110005****Subject Name: Elements of Electrical Engineering**

Date: 02 / 12 / 2010

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) Derive an expression for temperature coefficient at temperature  $t$ ,  $\alpha_t = \alpha_0 / (1 + \alpha_0 t)$ . Where notations have usual meanings. **05**
- (b) Find the resistance between terminals A and B as shown in figure 1. All values are in ohms. **05**

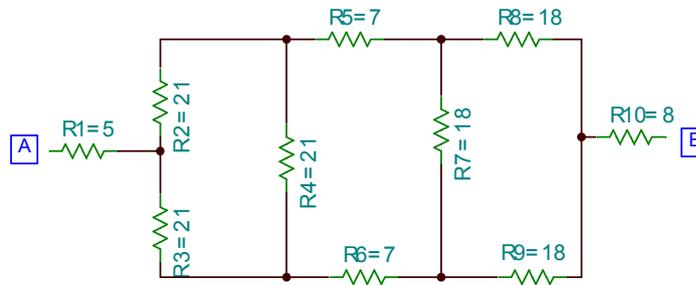


Figure 1

- (c) State and explain the Kirchoff's current and voltage laws **04**
- Q.2** (a) Derive an expression for the voltage across the capacitor during charging through the resistor at any instant  $V_c = V (1 - e^{-t/T})$  where  $V$  is the battery source voltage and  $T$  is the time constant of the circuit. **07**
- (b) Two capacitors  $C_1 = 4\mu F$  and  $C_2 = 2\mu F$  are connected in parallel across a 200V DC supply find (1) Equivalent capacitance (2) charge across each capacitor (3) If this parallel capacitor combination connected in series with  $6\mu F$  then what would be the equivalent capacitance of circuit becomes? **07**
- OR**
- (b) A magnetic circuit is existed by a 90 turn coil. The cross sectional area and length of the magnetic circuit is 5 square cm and 25cm respectively. When the current is 2A, the total flux is 0.3mWb. Find (1) H (2) Relative permeability of core. **07**
- Q.3** (a) Explain Magnetic Hysteresis phenomena using hysteresis loop. **05**
- (b) Compare similarities and dissimilarities between electrical and magnetic circuit. **05**
- (c) Explain different types of capacitors in brief. **04**
- OR**
- Q.3** (a) State the Lenz's law and explain statically induced emf. **05**
- (b) What are the faraday's laws of electromagnetic of induction and derive an expression  $e = -N d\Phi/dt$  where notations have usual meanings **05**
- (c) Define (1) MMF (2) Magnetic flux density (3) Retentivity (4) Reluctance **04**

- Q.4** (a) Explain the phenomena of generation of Alternating voltages and currents and derive expression for it with suitable diagrams **06**  
 (b) Two impedance  $Z_1 = (10 + j15) \Omega$  and  $Z_2 = (6 - j8) \Omega$  are connected in parallel and this combination takes 20A find the supply voltage? **04**  
 (c) Define the following terms with respect to AC waveforms (1) Form factor (2) Frequency **04**

**OR**

- Q.4** (a) A resistance of  $10\Omega$ , an inductance of  $0.2H$  and a capacitance of  $100\mu F$  are connected in series across  $220V$ ,  $50Hz$  mains. Determine the following (1) Impedance (2) current (3) voltage across R,L,and C (4) Power Factor **06**  
 (b) A circuit consists of a resistance of  $4\Omega$  and inductance of  $1H$  and a variable capacitance in series across a  $100V$ ,  $50Hz$  supply calculate (1) the value of capacitance to produce resonance (2) the voltage across capacitor **04**  
 (c) Define the following terms with respect to AC waveforms (1) phase (2) Time period **04**

- Q.5** (a) A balanced star connected load of  $(4 + j3) \Omega$  per phase is connected to a balance 3 phase  $400V$  supply. Find the line current, power factor, active power and reactive power. **06**  
 (b) What is Battery? Explain the construction and working of any battery. **04**  
 (c) Draw the stair case wiring diagram. Which protective devices are utilized to protect house wiring against overload/ short circuit? **04**

**OR**

- Q.5** (a) Explain the types of lighting schemes with suitable diagrams **06**  
 (b) Explain the construction of a cable with functions of its various parts with the help of neat diagram. **04**  
 (c) What is an electric shock? Why grounding is required? **04**

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