

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-1/2 EXAMINATION – WINTER 2021****Subject Code:2110005****Date:29/03/2022****Subject Name:Elements of Electrical Engineering****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Question No. 1 is compulsory. Attempt any four out of remaining Six questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

<b>Q.1</b>	<b>Objective Question (MCQ)</b>	<b>Mark</b>
	<p>(a)</p> <ol style="list-style-type: none"><li>1. Kirchoff's current law is applicable to only (a) closed loops in a network      (b) electronics circuits (c) junctions in a network      (d) electric circuits.</li><li>2. A capacitor that stores a charge of 0.5 C at 10 volts has a capacitance of _____ farad. (a) 5                      (b) 20                      (c) 10                      (d) 0.05</li><li>3. According to Faraday's Laws of Electromagnetic Induction, an e.m.f. is induced in a conductor whenever it (a) lies in a magnetic field (b) cuts magnetic flux (c) moves parallel to the direction of the magnetic field (d) lies perpendicular to the magnetic flux.</li><li>4. The r.m.s. value of a half-wave rectified current is 10A, its value for full-wave rectification would be _____ amperes. (a) 20                      (b) 4.14                      (c) <math>20/\pi</math>                      (d) <math>40/\pi</math></li><li>5. The p.f. of an R-C circuit is (a) often zero                      (b) between zero and 1 (c) always unity                      (d) between zero and -1</li><li>6. The impedance of two parallel branches of a circuit are <math>(10+j10)\Omega</math> and <math>(10-j10)\Omega</math> respectively. The impedance of the parallel combination is (a) <math>20+j0\Omega</math>      (b) <math>10+j0\Omega</math>                      (c) <math>5-j5\Omega</math>                      (d) <math>0-j20\Omega</math></li><li>7. The frequency of DC supply is (a) 50Hz                      (b) 0Hz                      (c) 10 Hz                      (d) 25Hz</li></ol>	<b>07</b>
	<p>(b) <b>Do the following</b></p> <ol style="list-style-type: none"><li>1. Define the term for sinusoidal supply (i) time period (ii) amplitude.</li><li>2. An active element in a circuit is one which supplies energy. (True/False).</li><li>3. Electric lines of force enter or leave a charged surface at an angle _____°.</li><li>4. State the ohm's law.</li><li>5. The equation of resonant frequency for series circuit _____.</li><li>6. Write the full name of the following protective devices (i) ELCB    (ii) MCCB.</li><li>7. Define Lumens.</li></ol>	<b>07</b>

- Q.2** (a) State Kirchoffs' Voltage Law applied to electric circuit with suitable example. **03**  
 (b) Calculate equivalent resistance between terminal A & B for the network shown in **Figure 1**. **04**  
 (c) For the network shown in **Figure 2**, calculate the current in each branch using mesh current analysis method. **07**
- Q.3** (a) Define the following term: **03**  
 (i) Electric field (ii) Electric field intensity (iii) Electric field density.  
 (b) Determine the equivalent capacitance between terminal A & B for the network shown in **Figure 3**. All capacitance values are in  $\mu\text{F}$ . **04**  
 (c) Derive an expression of capacitance for parallel plate in case (i) Uniform dielectric medium (ii) Medium partly by air. **07**
- Q.4** (a) Explain the Faraday's Laws of electromagnetic induction. **03**  
 (b) State the comparison between magnetic circuit and electric circuit. **04**  
 (c) Two coils, A of 12,500 turns and B of 16,000 turns, lie in parallel planes so that 60% of flux produced in A links coil B. It is found that a current of 5A produces a flux of 0.6 mWb while the same current in B produces 0.8 mWb. Determine (i) mutual inductance (ii) coupling coefficient. **07**
- Q.5** (a) Define the following terms for pure AC (alternating current) signal (i) crest factor (ii) Form factor (iii) Average value. **03**  
 (b) Obtain the RMS value for half wave rectified output voltage. **04**  
 (c) Two impedances  $Z_1$  and  $Z_2$  when connected separately across a 230V, 50Hz supply consumed 100 W and 60W at a power factor of 0.5 lagging and 0.6 leading respectively. If these impedances are now connected in series across the same supply, find : **07**  
 (i) total power absorbed (ii) overall p.f.
- Q.6** (a) Write the comparison between series resonance and parallel resonance condition in AC network. **03**  
 (b) Derive the relation between line-current and phase-current in three-phase three-wire delta connected network. **04**  
 (c) Phase voltage and current of a star-connected inductive load is 150V and 25A. Power factor of load is 0.707(lag). Assuming that the system is 3-wire and power is measured using two wattmeters, find the readings of wattmeters. **07**
- Q.7** (a) State the significance for the following in AC network: **03**  
 (i) Earthing (ii) MCB (ii) ELCB  
 (b) Enlist various types of wiring used as domestic and industrial purpose. **04**  
 (c) State and explain various types of lighting schemes. **07**

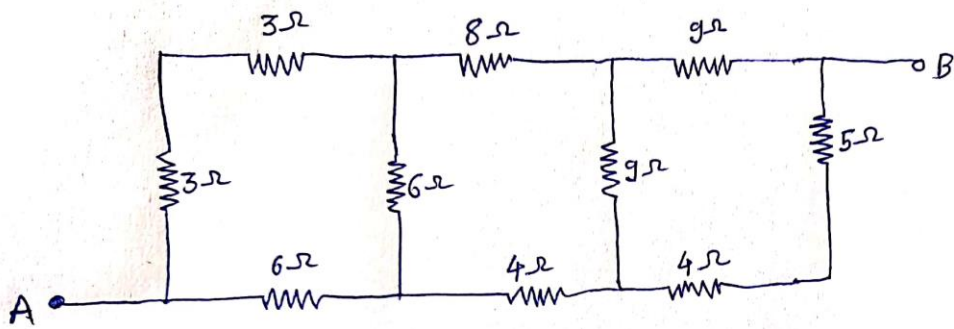


Figure-1

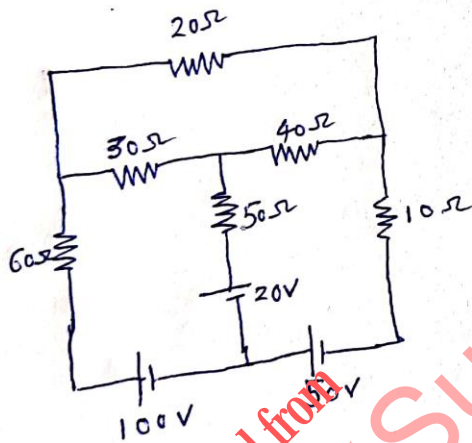


Figure-2

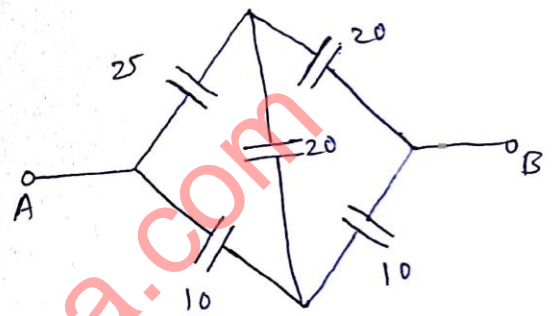


Figure-3

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