

USN										
<b>FIRST Semester B. E. Degree Semester End Examination (SEE), Jan/ Feb 2024</b>										
<b>Elements of Electrical Engineering (Mechanical Engineering)</b>										
(Model Question Paper - 1)										
[Time: 3 Hours]								[Maximum Marks: 100]		
			<u>Instructions to students:</u>							
			i. Answer FIVE FULL Questions as per choice. ii. Use BLACK ball point pen for text, figure, table, etc. iii. Assume missing data, if any.							

Marks      CO      RBT  
Level

### Module 1

1. a) Define Kirchoff's laws with suitable examples for each [04 Marks]      CO1      L2
- b) With neat single line diagram explain in detail the structure of electrical power system. [08 Marks]      CO1      L2
- c) With the typical layout, working and all components of any one type wind power plant. [08 Marks]      CO1      L2

OR

2. a) Define ohms laws with relevant equations and its limitations. [04 Marks]      CO1      L2
- b) Define and list the advantages and disadvantages for Conventional and non-conventional energy resources. [08 Marks]      CO1      L2
- c) With neat block diagram, working of any one solar PV system for generation of electricity. [08 Marks]      CO1      L2

### Module 2

3. a) For the circuit shown in figure 1, solve for E & I<sub>2</sub>.  
The voltage drop across 8 ohms was noted as 20V. [10 Marks]      CO2      L4

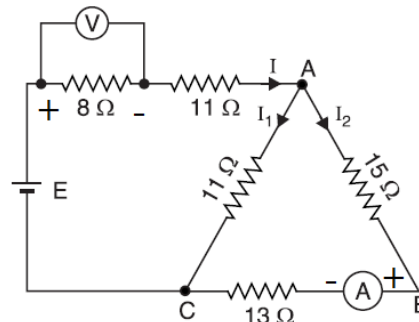
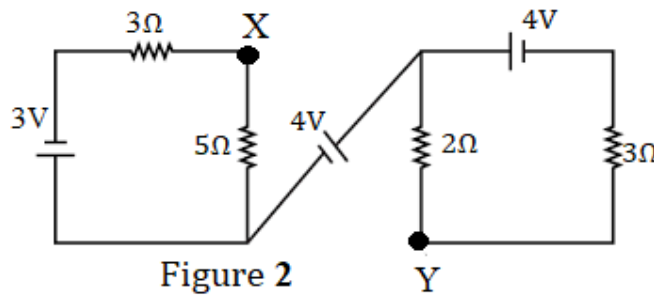


Figure 1

- b) An alternating current varying sinusoidally with a frequency of 50Hz has an rms value of 20A. i) write down the equation for the instantaneous value of current. ii) Find the value at the instant 0.0125sec, after passing through a +ve maximum value and iii) At what time measure from the +ve maximum value, will the instantaneous current be 14.14A. [10 Marks]      CO2      L3

OR

4. a) For the circuit shown in figure 2, find the voltage drop  $V_{XY}$  across nodes XY, also find the power associated with 3V.

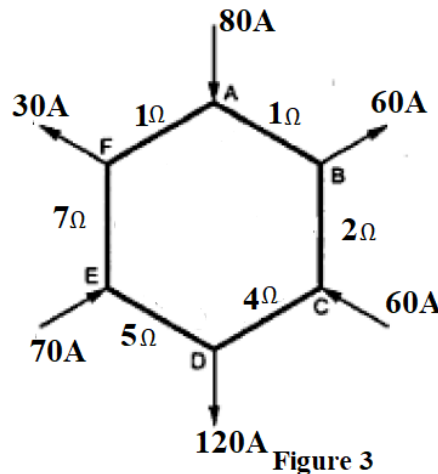


[06 Marks] CO2 L4

- b) Define Instantaneous value, frequency, phase, phase difference, time period with relevant equations and diagrams.

[06 Marks] CO2 L2

Solve for all branch currents for the circuit shown in figure 3



[08 Marks] CO2 L4

**Module 3**

Discuss the following:

5. a) 1) Working principle of three phase Induction Motor [12 Marks] CO3 L2  
 2) Rotating magnetic field, with neat vector diagram and relevant equations  
 b) Discuss the construction and working of single-phase Induction motor with neat diagrams and relevant equations. [08 Marks] CO3 L2

**OR**

- a) Discuss the necessity of starters and with diagram explain star-delta starter. [10 Marks] CO3 L2  
 6. b) A 3 phase induction motor with 4 poles is supplied from an alternator having six poles and running at 1000 rpm. Calculate (i) Synchronous speed of the induction motor (ii) Its speed when the slip is 0.04 (iii) Frequency of the rotor e.m.f, when the speed is 600 r.p.m. [10 Marks] CO3 L3

**Module 4**

- a) Explain the working principle of DC motor. Define torque and derive torque equation. [10 Marks] CO4 L2  
 7. b) A 4 pole, 220V, lap connected DC shunt motor has 36 slots, each slot containing 16 conductors. It draws a current of 40A from supply. The field resistance and armature resistance are 110 ohms and 0.1 ohms respectively. [10 Marks] CO4 L4

The motor develops an output of 6kW. The flux per pole is 40m Wb. Calculate (a) the speed (b) the torque developed by the armature and (c) the shaft torque.

OR

8. a) List the classification of batteries and explain any one with relevant diagram and equations. [05 Marks] CO4 L2
- b) Discuss the physical principles of the conversion of solar radiation into heat. [05 Marks] CO4 L2
- c) Derive the equation for conversion efficiency and power output for solar photo-voltaic. [10 Marks] CO4 L2

**Module 5**

9. a) With neat circuit/block diagram discuss service main, meter board and distribution board with voltage ratings of different appliances. [08 Marks] CO5 L2
- b) Calculate the electric bill at the end of a month of 30 days at Rs.2.00 per unit if 6 lamps of 40 watt each burn for 8 hours per day, an electric iron of 1 kW is used for 2 hours per day and 4 fans of 50 watt each are used for 10 hours per day. [12 Marks] CO5 L4

OR

Discuss the following.

10. a) 1) Electric shock  
2) Tariff [12 Marks] CO5 L2  
3) Plate earthing  
4) Electrical unit.
- b) A household uses the following electric appliances:  
(a) Refrigerator of rating 400 W for ten hours each day.  
(b) Two electric fans of rating 80 W each for twelve hours each day. [08 Marks] CO5 L4  
(c) Six electric tubes of rating 18 W each for 6 hours each day.
- Calculate the electricity bill of the household for the month of June if the cost per unit of electric energy is ₹ 3.00.

\*\*\*\*\*