

SEE MODEL QUESTION PAPER-1

UG

First Semester B.E. Degree Examination, April - 2021

Fundamentals of Electrical Engineering

Time: 3 hrs.

Course Code: 20ELE14

Max. Marks: 100

Note: Answer any Five full questions, choosing ONE full question from each module.

Module 1		Marks
1	a. Draw a schematic diagram and explain various stages of nuclear power station. b. List the advantages of wind power plant. c. Draw a single line diagram and explain different stages of a typical electrical power system.	8 4 8
OR		
2	a. Draw a schematic diagram and explain different stages of steam power station. a. List the applications of solar PV system. b. Explain different parts of Electric Vehicles.	10 4 6
Module 2		
3	a. State and explain Kirchhoff's Voltage law. b. A $10\ \Omega$ resistor is connected in series with the parallel combination of $15\ \Omega$ and $20\ \Omega$ resistors. The circuit is applied with a DC battery. The power taken by the circuit is 150 Watts. Find the total current through the circuit and power consumed in all resistors. c. Apply Nodal analysis to obtain voltage across $3\ \Omega$ resistor shown in figure 3c.	4 6 10
	<p style="text-align: center;">Figure3c.</p>	
OR		
4	a. State and explain Ohm's law. Mention its limitations. b. In the parallel arrangements of resistors shown in Fig 4.b, current through $8\ \Omega$ resistor is 2.5 A. Find i) current in other resistors, ii) Resistor X, iii) the equivalent resistance. c. Determine the currents in various branches in the network shown in Fig 4c using mesh analysis.	5 7 8

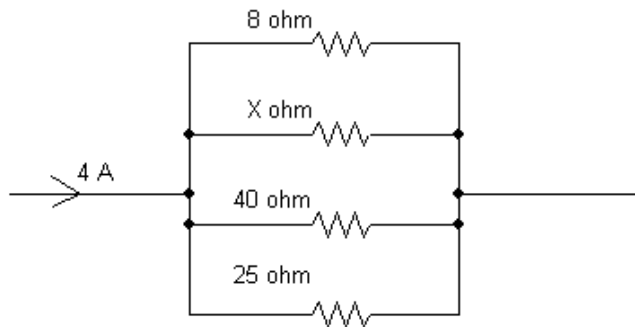


Figure 4.b

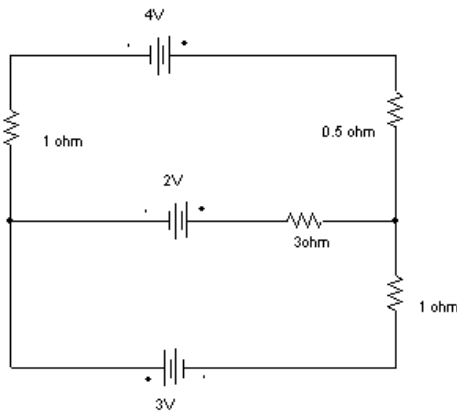


Figure 4.c

Module 3

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|---|---|---|
| 5 | a. Define power factor, impedance and admittance with reference to ac circuit. | 6 |
| | b. Define RMS value of current and derive an expression of RMS value for a sinusoidally varying current. | 6 |
| | c. An e.m.f given by $100 \sin(314t - \frac{\pi}{4})$ is applied to a circuit and the current is $20 \sin(314t - 1.5708)$ Amps. Find:
i. Frequency and ii. Circuit elements. | 8 |

OR

- | | | |
|---|---|---|
| 6 | a. Prove that in pure inductor voltage leads the current by 90 degree. | 6 |
| | b. Time period of a signal is 0.02 sec, Peak value = 12 V, voltage = 3 V at t=0. Write the equation for instantaneous value of voltage. Find instantaneous value after 0.003 sec. | 6 |
| | c. Two Impedances $Z_1 = 150 - j157\Omega$ and $Z_2 = 100 + j 110\Omega$ are connected in Parallel across 200 V, 50 Hz supply. Find,
i) Branch Currents, ii) Total current iii) Total Power
iv) Power factor of the circuit | 8 |

Module 4

- | | | |
|---|---|---|
| 7 | a. Derive and explain Relationship between Line and Phase Quantities for a Three Phase Star Connected load. | 8 |
| | b. Derive an expression for EMF equation for an alternator. | 6 |
| | c. A balanced three phase star connected load draws power from 440V supply. The two wattmeters connected indicate $W_1 = 5 \text{ kW}$ and $W_2 = 1.2 \text{ kW}$. Calculate power, power factor and current in the circuit. | 6 |

OR		
8	a. Show that two wattmeters are enough to measure power in a three phase circuit. b. With neat sketch, explain the construction of salient pole alternator. c. A 2 pole, 3 phase alternator runs at 3000 rpm. It has 42 armature slots with 2 conductors in each slot. Calculate the flux per pole required to generate a line voltage of 2300 V. Assume distribution factor as 0.952 and the pitch factor as 0.956.	7 7 6
Module 5		
9	a. Explain the concept of rotating magnetic field with reference to three phase induction motor. b. Derive an equation for the EMF induced in the secondary winding of a transformer. c. Determine the efficiency of a 150 kVA transformer at 50% full-load of 0.8 p.f. lagging if the copper loss at full-load is 1600 W and the iron loss 1400 W.	10 4 6
OR		
10	a. Explain the principle of construction of a single-phase core type transformer. b. Define slip. Derive an expression for frequency of Rotor current. c. A 10-pole induction motor is supplied by a 6-pole alternator, which is driven at 1200 r.p.m. If the motor runs with a slip of 3% what is its speed?	8 6 6