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Siddaganga Institute of Technology, Tumakuru-572 103

(An Autonomous Institution affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

First Semester Bachelor of Engineering Examinations April-May 2023

Introduction to Electrical Engineering

[Except Electrical and Electronics Engg.]

Time: 3 Hours **Max. Marks: 100**

Note : 1. Revealing of Identity in any form in the answer book will be treated as malpractice.
2. Answer any five questions choosing one full question from each unit.

			M	BL	CO	PO	PSO
		Unit - I					
1	a)	Explain the working of thermal power station with the help of neat block diagram.	6	2	1	1	
	b)	Two resistors R_1 and R_2 are connected in parallel and a voltage of 200V is applied between the terminals. The total current taken is 25A and the power dissipated in R_1 is 1500Watts. Determine R_1 and R_2.	6	3	1	2	
	c)	Determine the currents I_1 and I_2 in the network shown in Fig. 1c.					

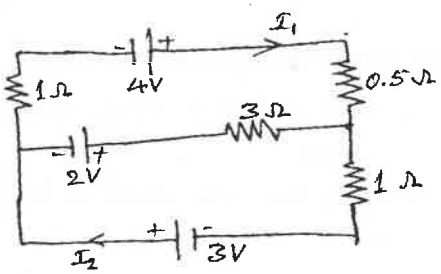

Fig. 1c

			8	3	1	2	
		OR					
2	a)	Explain solar and wind power generation with the help of neat block diagrams.	8	2	1	1	
	b)	State and explain Kirchoff's voltage and current laws.	6	2	1	2	
	c)	Apply Kirchoff's laws to calculate the current in all branches of the network shown in Fig. 2c.					

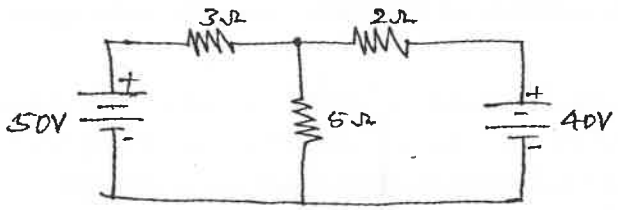

Fig. 2c

			6	2	1	2	
		Unit - II					
3	a)	Define the following terms with necessary expressions: i) RMS value ii) Average value iii) Phase difference	6	2	2	1	
	b)	A current of 0.9A flows through a series combination of resistor of 120Ω and a capacitive reactance of 250Ω. Find the impedance, power factor, supply voltage, apparent power and active power.	7	2	2	2	
	c)	A balanced delta connected load of (8+j6)Ω per phase is supplied from 3-phase, 208V, 50Hz source. Determine line current, phase current, apparent power and active power.	7	2	2	2	
		OR					
4	a)	From the fundamentals, show that the average power consumed in a pure capacitance circuit is always zero.	6	2	2	2	

Please Turn Over

	b)	A balanced 3-phase load consists of three coils, each of resistance 20Ω and inductance 0.5H. Determine the line current and the total active power when the coils are (i) star connected (ii) delta connected to a 400V, 50Hz, 3-phase supply	8	3	2	2
	c)	A series RL-circuit consumes a power of 400Watts with a power factor of 0.8 from 120V, 50Hz, AC supply. Calculate the values of R & L.	6	3	2	2

Unit - III

5	a)	Classify the types of dc generators based on the mode of excitation. Write the neat circuit diagram for shunt and series type and expression for the terminal voltage and current in each case.	6	2	3	2
	b)	A 8-pole dc generator has 500 armature conductors and a useful flux of 0.05wb. i) What will be the emf generated if it is lap connected and runs at 1200 rpm? ii) What must be the speed at which it is to be driven to produce the same emf, if it is wave-wound?	4	2	3	2
	c)	Derive an expression for torque developed in the armature of a dc motor.	6	2	3	1
	d)	What is back emf? Explain its significance in the operation of a dc motor.	4	2	3	1

OR

6	a)	Draw the speed v/s armature current characteristics of dc shunt motor and series motor. Mention one application in each case.	6	3	3	2
	b)	A 220V dc shunt motor draws a load current of 40A. The armature resistance is 0.2Ω and shunt field resistance is 110Ω. The motor, rotating at a speed of 1800 rpm has six poles and 360 lap wound armature conductors. Determine (i) Back emf in the armature and (ii) flux/pole	6	2	3	2
	c)	Draw the cross-sectional view of a dc generator and explain the functions of each part.	8	2	3	1

Unit - IV

7	a)	Derive an expression for emf equation of a transformer. Mention types of transformers.	6	2	4	2
	b)	A 125kVA transformer has a primary voltage of 2000V at 60Hz. The primary turns are 182 and secondary turns are 40. Neglect losses and calculate (i) No-load sec. emf (ii) Full load primary and secondary currents (iii) Flux in the core	6	2	4	2
	c)	Show that a rotating magnetic field of constant magnitude is developed in the stator winding of a three phase induction motor with the help of vector diagrams.	8	3	4	2

OR

8	a)	The no-load current of a single phase transformer is 4A at 0.3PF, when supplied at 230V, 50Hz. The number of turns on the primary is 250. Determine (i) the maximum value of the flux in the core (ii) the core loss (iii) magnetising component and active component of the no-load current	6	3	4	2
	b)	A 10kVA, 400/200V, 50Hz, single phase transformer has a full load copper loss of 200W and has a full load efficiency of 96% at 0.8PF (lag). Determine the iron loss. What would be the efficiency at half full load and unity power factor.	8	3	4	2
	c)	A 3-phase induction motor is wound for 4-poles and is supplied from a 50Hz supply. Determine (i) synchronous speed (ii) the speed of the rotor when the slip is 4% and (iii) the rotor frequency when the speed of the rotor is 600 rpm.	6	2	4	2

Contd...

Unit - V

9	a)	Explain two way control of lamp with truth table and neat circuit diagram.	6	2	5	1
	b)	The load schedule in a domestic unit for a day is as follows: 6 am to 8 am – 1.5kW 8 am to 1 pm – 0.25kW 1 pm to 6 pm – 0.50kW 6 pm to 10 pm – 0.30kW If the domestic unit has a maximum demand of 3kW, determine the electricity bill of the domestic unit for one month if the applicable tariff is Rs.100/- per kW per month as fixed charges and Rs.4.50 per unit as running charges.	8	2	5	2
	c)	Discuss the merits and demerits of Fuse and MCB.	6	2	5	1

OR

10	a)	Discuss different types of wiring used for domestic purposes.	6	2	5	1
	b)	Explain two-part tariff with example.	4	2	5	1
	c)	Explain pipe earthing with the help of neat sketch.	6	2	5	1
	d)	List the safety precautions to avoid electric shock.	4	1	5	1