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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; February / March - 2022

Power Electronics

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Select various types of power semiconductor devices to develop different types of Power converter systems based on control characteristics.

CO2: Analyze the different base drive control methodologies and various types of Protection Circuits needed for converter system.

CO3: Distinguish between various types of power converter systems, compare and analyze them.

CO4: Understand and analyze the various types of commutation circuits and implement them.

CO5: Design and develop different types of converter and inverter system.

Note: ***I) PART - A*** *is compulsory.* ***Two*** *marks for each question.*

II) PART - B*: Answer any* ***Two*** *sub questions (from a, b, c) for Maximum of* ***18 marks*** *from each unit.*

Q. No.		Questions	Marks	BLs	COs	POs
		I : PART - A	**10**			
I	a.	Differentiate between diode and SCR.	2	L3	CO1	PO1
	b.	What are the peripheral effects in power electronics equipments?	2	L1	CO2	PO1
	c.	What do you mean by phase angle control?	2	L1	CO3	PO1
	d.	Define duty ratio of a chopper.	2	L1	CO4	PO1
	e.	What is the function of freewheeling diode?	2	L1	CO5	PO1
		II : PART - B	**90**			
		UNIT - I	**18**			
1	a.	List the various applications of power electronics converters.	9	L1	CO1	PO1
	b.	Sketch and explain the switching characteristics of IGBT.	9	L2	CO1	PO1
	c.	Explain the control characteristics of SCR and MOSFET device.	9	L2	CO1	PO1
		UNIT - II	**18**			
2	a.	Explain the two transistor model of a thyristor and show that anode current is affected by gate current.	9	L4	CO2	PO2
	b.	Explain dynamic turn-on and turn-off characteristics of a SCR.	9	L4	CO2	PO2
	c.	Explain; i) Need of snubber circuit ii) dv/dt and di/dt protection	9	L2	CO2	PO2
		UNIT - III	**18**			
3	a.	With circuit diagram and waveform, explain the working of a single phase bi-directional AC voltage controller for inductive load. Derive the RMS output voltage.	9	L2	CO3	PO2
	b.	What is commutation? With diagram and waveform, explain working of an impulse resonant commutation.	9	L2	CO3	PO1

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	c.	An AC voltage controller has a resistive load R = 10 Ω, RMS input voltage Vs = 120 V, at 60 Hz. The thyristors is ON for n = 25 cycles and is off for m = 75 cycles. Determine; i) RMS output voltage (V_o) ii) Input PF iii) Avg. and RMS current in thyristors	9	L2	CO3	PO2
		UNIT - IV	**18**			
4	a.	With circuit diagram and waveform, explain the chopper classification and their applications.	9	L2	CO4	PO1
	b.	With necessary circuit and waveforms, explain three phase bridge inverter in 120° mode.	9	L4	CO4	PO1
	c.	A chopper is supplied to inductive load with a freewheeling diode. L = 5 H, R = 10 Ω. The input to the chopper is 200 V and the chopper frequency is 100 Hz. The ON to OFF time ratio is 2:3. Compute; i) Average load current ii) Limits between which current fluctuates	9	L2	CO4	PO2
		UNIT - V	**18**			
5	a.	Explain the principle operation of 3-φ half wave converter with R-load. Derive an expression for its output voltage of RMS value.	9	L4	CO5	PO1
	b.	i) List the comparison of half controlled and fully controlled rectifiers. ii) Explain the performance parameters of a line commutated converters.	6 3	L2	CO5	PO1
	c.	Explain the principle of operation of 1-φ full wave converter with RL load. Derive an expression for its out voltage of Avg and RMS values.	9	L4	CO5	PO2

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