U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE5PCPE1 **Max Marks: 100**
Course: Power Electronics - I

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		In a certain application, a power converter of rating 500W with a high efficiency is required. Which power device will you choose for this application if the switching frequency of the devices to be selected as 100kHz. Justify your answer.	CO1	PO1	**04**
	b)		What is the importance of knowing the control characteristics of a power device? Plot the control characteristics of thyristor and transistor and list out the differences.	CO1	PO1	**08**
	c)		Write a note on intelligent power modules. Draw the functional block diagram of a smart power system	CO1	PO1	**08**
			UNIT - II			
2	a)		What is the significance of reverse recovery time of a power diode? The reverse recovery time of a diode is t_{rr} = 5 µs, and the rate of fall of the diode current is di/dt = 80 A/µs. If the softness factor is SF = 0.5, determine (a) the storage charge Q_{RR}, and (b) the peak reverse current I_{RR}.	CO2	PO3	**06**
	b)		How is a Schottky diode different from a normal diode? How does it operate? Mention the special features of SiC Schottky diodes.	CO2	PO3	**06**
	c)		Draw the circuit diagram of a single-phase bridge rectifier that supplies a very high inductive load such as a dc motor. The turns ratio of the transformer is unity. The load is such that the motor draws a ripple-free armature current of Ia. Draw the waveforms of load current and source current. Determine (a) the HF of input current and (b) the input PF of the rectifier.	CO2	PO3	**08**
			UNIT - III			
3	a)		With relevant switching models, plot and discuss the switching characteristics of power BJT.	CO3	PO2	**10**
	b)		Draw the structural diagrams of Enhancement type and depletion type MOSFETS. List the major differences between the two types.	CO3	PO2	**10**

			Which type of MOSFET is ideal for switching applications? Give reason			
			OR			
	4	a)	With switching models and waveforms, explain the dynamic characteristics of MOSFET	CO3	PO2	**10**
		b)	The bipolar transistor is specified to have β_F in the range of 8 to 40. The load resistance is $R_C = 11\ \Omega$. The dc supply voltage is V_{CC} = 200 V and the input voltage to the base circuit is V_B = 10 V. If $V_{CE(sat)}$ = 1.0 V and $V_{BE(sat)}$ = 1.5 V, find (a) the value of R_B that results in saturation with an ODF of 5, (b) the β_{forced}.	CO3	PO2	**10**
			UNIT - IV			
	5	a)	What are the advantages of SiC IGBTs over normal Si based IGBTs? Justify your answer with structural diagram of SiC IGBT	CO3	PO2	**10**
		b)	Why is it important to isolate gate and base drive circuits in a power electronic converter? Discuss any two methods of isolation	CO4	PO2	**10**
			OR			
	6	a)	With a neat cross-sectional diagram discuss the working of IGBT. Plot the static characteristics	CO3	PO2	**10**
		b)	With relevant circuit diagram, explain the working of the following base control techniques of a transistor. (i) Proportional base control (ii) Antisaturation base control	CO4	PO2	**10**
			UNIT - V			
	7	a)	With the circuit diagram and relevant waveforms, discuss the operation of synchronized UJT firing circuit for firing an SCR.	CO3	PO2	**10**
		b)	Draw the static characteristics of S. C. R. and explain its different states of operation. Define Holding current and Latching current.	CO2	PO3	**10**

****