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

Autonomous Institute Affiliated to VTU

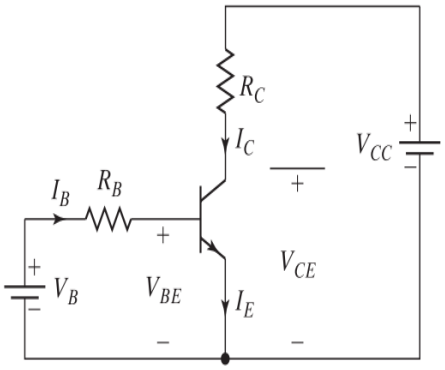
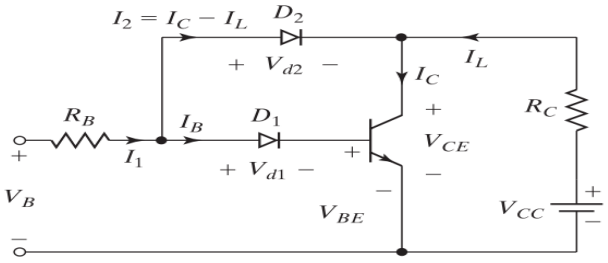
September / October 2024 Supplementary Examinations

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)	Classify power semiconductor devices. List the devices that you would select for low, medium and high power applications.	*CO3*	*PO2*	**08**
	b)	Illustrate how i) AC to DC conversion ii) DC to AC conversion can be accomplished using power semiconductor devices having a control input terminal.	*CO3*	*PO2*	**08**
	c)	Compare any two ideal characteristics versus Practical characteristics of power semiconductor devices.	*CO3*	*PO2*	**04**
		UNIT - II			
2	a)	Analytically obtain an expression for output current of a single phase diode bridge rectifier with R-L-E load and continuous current.	*CO2*	*PO3*	**10**
	b)	A single phase bridge rectifier is fed from 220 V AC mains. The load resistance is 12.4 ohm Determine i) Average output voltage. ii) Average output current. iii) RMS output current. iv) Conversion efficiency. v) Ripple factor.	*CO2*	*PO3*	**10**
		UNIT - III			
3	a)	Explain the structure of a power BJT.	*CO1*	*PO1*	**06**
	b)	List the differences between depletion type and enhancement power MOSFETs	*CO1*	*PO1*	**06**
	c)	For the Transistor switch shown in Fig 3.c β of the transistor varies from 20 to 80. The load resistance R_C = 10 Ohm, the DC supply voltage V_{CC} = 50 V and the input voltage to the base circuit is V_B = 5V. If $V_{CE\ (sat)}$ = 1.5 V, $V_{BE\ (sat)}$ = 1.8 V determine i) the value of R_B that will result in saturation with an overdrive factor of 22. ii) Forced β.	*CO4*	*PO2*	**08**

			 Fig 3.c			
			OR			
4	a)	With the help of neat diagrams explain the working of n-channel Enhancement type MOSFET.	*CO1*	*PO1*	**08**
	b)	Sketch and explain the switching characteristics of a power BJT.	*CO3*	*PO2*	**07**
	c)	Compare the properties of Power BJT and Power MOSFET.	*CO3*	*PO2*	**05**
		UNIT - IV			
5	a)	Describe the structure and working of IGBT.	*CO1*	*PO1*	**07**
	b)	For the circuit shown in Fig 5.b VCC = 350V, RC=4 Ω, Vd1 =3.7 V, Vd2 = 0.8 V, VB = 16 V RB = 1.3 Ω and β = 13. Calculate i) the Collector current without clamping. ii) the Collector clamping voltage VCE. iii) the collector current with clamping.  Fig 5.b	*CO4*	*PO2*	**08**
	c)	Compare Power BJT and Power MOSFET.	*CO3*	*PO2*	**05**
		OR			
6	a)	Illustrate with the help of a neat circuit diagram how fast turn on of MOSFET switch can be achieved with a R-C circuit.	*CO4*	*PO2*	**07**
	b)	Sketch and Explain switching characteristics of IGBT and comment on the tail current.	*CO3*	*PO2*	**08**
	c)	Illustrate the use of pulse transformers for isolation of BJT base drive.	*CO4*	*PO2*	**05**
		UNIT - V			
7	a)	Explain the operation of a Thyristor using two transistor analogy.	*CO1*	*PO1*	**08**
	b)	Illustrate with the help of a circuit diagram any one method of thyristor turn off.	*CO4*	*PO2*	**06**
	c)	What is Electromagnetic Interference (EMI)? What are the sources of EMI in a power converter? How can EMI generation be minimized?	*CO4*	*PO2*	**06**

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