B.E.E 3RD YEAR 2ND SEMESTER EXAM.2017(OLD)

SUBJECT : POWER ELECTRONICS   Page 1 of 1

Time: Three Hours

Full Marks: 100

Question No.	PART – I 50 Marks for each part	Marks
	Answer any THREE questions. Two marks are reserved for neat and well organized answer.	
1.(i)	Classify power diodes according to their reverse recovery time. What is SRD and HRD and which one is preferred in real life and why ?	8
(ii)	How steady state power loss is calculated in a power diode?	4
(iii)	What is Schottky diode ?	4
2.(i)	State the important characteristics of a power BJT.	6
ii)	Why negative base drive is used in power BJT and how is it implemented ?	10
3.(i)	Sketch the structure of an IGBT and explain the working principle of it. What are the advantages of IGBT over BJT?	12
(ii)	What are the advantages and disadvantages of SCR over other power electronic devices ?	4
4.i)	Sketch the circuit and explain the operation of a Step-down DC-DC chopper feeding a resistive load, using relevant waveforms. Derive the expression of its output average voltage in terms of its input voltage.	12
(ii)	220 volts DC is to be stepped down to 100 volts DC to supply a 5 ohms resistive load through a LC output filter. Calculate the duty cycle needed at constant frequency of 25 KHz.	4
5. (i) (ii) (iii)	Write the short notes on any TWO of the followings: Power MOSFET. Full Bridge Inverter. Switch Mode Power Supply (SMPS).	8+8

B.E ELECTRICAL ENGINEERING THIRD YEAR SECOND SEMESTER (Old) - 2017

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(50 marks for this part)

Use a separate Answer-Script for each part

No. of Questions		PART -II Answer any Three (Two marks reserved for well organized answers)	Marks
6)		Show the following waveforms for a 1-phase uncontrolled half wave rectifier assuming the load to be resistive : (i) Output voltage, (ii) Load current, (iii) Diode voltage. For the above rectifier also determine : (iv) Average output voltage, (v) Load RMS voltage (vi) Efficiency (vii) Form factor (viii) Transformer utilization factor.	(16)
7)	a)	For a 1-phase uncontrolled full wave bridge rectifier deduce the expression for the following : (i) Average output voltage (ii) Load RMS voltage (iii) Efficiency (iv) Crest factor.	(8)
	b)	If in the above circuit the load is a R-L load, show the waveforms of the following: (i) Load Voltage (ii) Load Current (iii) Diode Current and (iv) Input Line Current.	(8)
8)		With suitable diagram, explain the operation of a 3-phase uncontrolled bridge rectifier. Hence, determine (a) average output voltage, (b) R.M.S. output voltage and (c) R.M.S. value of the diode current. Assume that the load resistance is R ohm and the supply voltage is $V_m \sin wt$ volts.	(16)
9)	a)	With proper diagrams explain the operation of a three-phase half-controlled rectifier with R-L load. Make suitable assumptions and draw the following waveforms: i) dc terminal voltage ii) voltage across the thyristors, iii) current in the thyristors.	(12)
	b)	An inductive load is supplied by a single-phase fully controlled bridge converter. The output current is maintained at constant value. The supply voltage is 230 V and the firing angle is maintained at $\pi/6$ radians. Determine the following performance parameters: (i) Average output voltage. ii) R.M.S value of output current.	(4)
10)	a)	Deduce the expression for the average and r.m.s load voltage of a three phase fully controlled full wave rectifier feeding a highly inductive load, (assume any firing angle α). Also sketch the waveforms of (i) load voltage (ii) thyristor currents. the same	(12)
	b)	What is commutation overlap? Explain with necessary sketches for a three phase half wave rectifier.	(4)