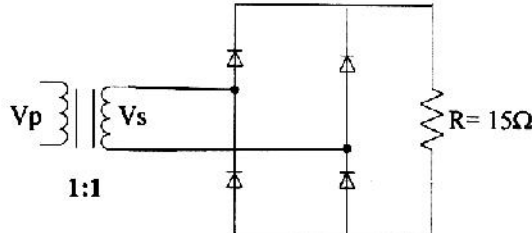


SUBJECT: - POWER ELECTRONICS

Time: Three hours

Full Marks: 100
(50 marks for this part)

Use a separate Answer-Script for each part

No. of Questions	PART - I Answer any Three (Two marks reserved for well organized answers)	Marks
1.	<p>a) Explain with relevant diagrams the operation of a single phase half wave uncontrolled rectifier feeding an R-L load. Also deduce the expression for the load current of this circuit.</p> <p>b) If the above circuit is connected with a 100 V, 50 Hz a.c supply and the R-L load has the value of $R = 100 \Omega$ and $L = 0.1H$, determine (i) average load current (ii) r.m.s load current, and (iii) the power absorbed by the resistor. Assume the load current conducting up to 40° beyond voltage zero.</p>	(10) (6)
2.	<div style="text-align: center;">  <p>Fig. Q.7</p> </div> <p>The single phase full wave diode rectifier shown in Fig. Q.7 has $V_p = 300 \sin 314t$ Volts. Determine (a) efficiency, (b) form factor, (c) ripple factor, (d) TUF, (e) the PIV of each diode, (f) crest factor of input current, and, (g) Input power factor. Also deduce the expressions for r.m.s load voltage and r.m.s load current.</p>	(10+6)
3.	<p>With suitable diagram, explain the operation of a single-phase half controlled bridge rectifier connected with an R-L load. Hence, determine the expression for (a) average output voltage and (b) R.M.S. output voltage. Show the relevant waveforms of voltage and current.</p>	(16)
4.	<p>A three phase fully controlled full wave rectifier is connected to a 380 V peak, 50 Hz three phase supply. The load is resistive with a value of 10Ω. If it is required to get 400 V DC output voltage, calculate (a) firing angle, and (b) r.m.s output voltage.</p>	(6+10)

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B.E ELECTRICAL ENGINEERING THIRD YEAR SECOND SEMESTER - 2017

SUBJECT: - POWER ELECTRONICS

Time: Three hours

Full Marks: 100
(50 marks for this part)

5.	<p>Also with the help of relevant sketches derive the expression for the average output voltage.</p> <p>Write short notes on any <i>two</i> of the following:</p> <p>(i) Single phase full wave uncontrolled rectifier circuit with R-C parallel load.</p> <p>(ii) Inverter operation with single phase fully controlled rectifier.</p> <p>(iii) Effect of source inductance for rectifier circuit.</p>	(8+8)
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SUBJECT : POWER ELECTRONICS

Question No.	PART – II 50 Marks for each part	Marks
	Answer any THREE questions. Two marks are reserved for neat and well organized answer.	
6. (i)	With the help of two-transistor model, show how regenerative action takes place in an SCR .	6
(ii)	What are the advantages and disadvantages of SCR over other power electronic devices ?	3
(iii)	Why power BJT is operated in the Quasi-saturation region and how is it implemented ?	
	OR	7
	Explain with the help of circuit diagram, any one Forced Commutation technique of an SCR.	
7. (i)	Sketch the structure of a power MOSFET and explain its working principle . What are the advantages and disadvantages of power MOSFET over SCR ?	8
(ii)	State the important characteristics of an IGBT OR of a power BJT.	4
(iii)	What is Schottky diode and what are its disadvantages over normal power diode ?	4
8. (i)	Sketch the circuit and explain the operation of a Buck-Boost type DC-DC converter feeding a resistive load using relevant waveforms, and derive the expression of output voltage in terms of its input voltage.	8
(ii)	Why is Pulse Width Modulation (PWM) technique preferred over Frequency Modulation (FM) technique to obtain variable duty cycle?	4
(iii)	A step down DC-DC chopper is fed from an input DC voltage of 150 volts. What is the required Duty cycle to obtain 12A load current at its output having a purely resistive load of 5 ohms ? If the switching frequency of the chopper is 200KHz, what is the OFF-time of the chopper?	4
9. i)	Sketch the circuit and explain, using suitable waveforms, the operation of a Push- Pull Inverter with fixed input DC voltage. What is the main disadvantage of this type of inverter specially in case of an inductive load? How can this disadvantage be overcome by using Full-Bridge Inverter?	10
(ii)	Draw the Schematic of a Switch Mode Power Supply (SMPS). What are the advantages and disadvantages of it over Linear Power Supply?	
	OR	6
	Explain the reverse recovery effect in an SCR.	

10.	Write the short notes on any TWO of the followings: (i) Boost type DC-DC chopper. (ii) Power Diodes. (iii) Power losses in a semiconductor devices.	8+8
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