

**SUBJECT : POWER ELECTRONICS**

Time: Three Hours

Full Marks: 100 (50 each part)

**Use a separate Answer-Script for each part**

Question No.	PART - I	Marks
	Answer any Three questions	
	<b>Two marks are reserved for neat and well organized answer.</b>	
1.	a) Write a short notes on SCR.	8
	b) Explain the reverse recovery effect in power diode.	4
	c) Show how average power loss in a power diode is calculated from its V-I characteristic ?	4
2.	a) State the main characteristics of an IGBT.	6
	b) State the important parameters of power MOSFET.	6
	c) Why power MOSFET can not block any reverse voltage ?	4
3.	(a) Explain the working principle of a power MOSFET.	8
	(b) Explain why negative base drive is used in power BJT .	8
4.	(a) Explain the working principle of a step up chopper using the relevant circuit and necessary wave.	8
	a) The input of a step up chopper is 180 volts and is feeding a resistance load of 8 ohms. What is the duty ratio if the load current is 40A ? What is the blocking voltage of the chopper ?	8
5.	a) Explain the working principle of a half bridge inverter with the help of necessary circuit and relevant waveform.	8
	b) Explain the working principle of a Boost chopper using necessary circuit diagram and also derive the expression of its output voltage.	8

**BACHELOR OF ENGINEERING IN  
ELECTRICAL ENGINEERING (EVENING) EXAMINATION, 2019**

(4th Year, 1st Semester)

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**PART-II**

Answer *any three* questions

*Two marks* are reserved for neatness and well organized answer script

- 1.a) Explain the operation of a single phase half wave rectifier feeding a RL load. Give necessary circuit diagram and waveforms. Also explain the operation of above rectifier in the presence of a freewheeling diode across the load. 10
- b) A single phase half-wave uncontrolled rectifier with RL load is fed from 230 V at 50 Hz,  $R = 10\Omega$ ,  $L = 5\text{mH}$ , extinction angle =  $210^\circ$ . Find average values of output voltage and output current for the following conditions.
  - i) With freewheeling diode
  - ii) Without freewheeling diode 6
2. Explain the operation of a three phase half wave rectifier circuit with resistive load R and obtain the following:  
Average output voltage, RMS output voltage, form factor, voltage ripple factor, transformer utilization factor and PIV. 16
3. a) Explain the operation of a Single Phase Full Wave Bridge Converter with R-L Load. Draw the output voltage and current waveforms. Also calculate the average and rms output voltage across the load. 10
- b) A resistive load of  $10\Omega$  is connected through a half wave SCR circuit fed from a 220 V, 50 Hz single phase source. Calculate the power delivered to the load for a firing angle of  $60^\circ$ . Find the value of input power factor. 6
4. a) A single phase half-wave diode rectifier is designed to supply DC output voltage of 230V to a load of  $R = 10\Omega$ . Calculate the ratings of the diode and transformer for this circuit arrangement. 6

- b) Draw the output voltage and current waveform of single phase half-wave diode rectifier circuit with inductive load L. 4
- c) A three phase half wave rectifier operates from a line voltage supply of 400Vrms. A resistive load of  $20\Omega$  is connected at the output of the rectifier. Calculate the average and rms current through the load. 6
5. Write short notes on any two of the following 8×2
- a) Single phase, mid-point type step-up cycloconverter
  - b) Single phase semiconverter with RLE load
  - c) Three phase full-wave converter with resistive load

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