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Seat No.

### T. E. (Electrical) (Semester – I) Examination, 2014 POWER ELECTRONICS (2008 Pattern)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Answers to the two Sections should be written in separate answer books.

- 2) Answer any three questions from each Section.
- 3) Black figures to the **right** indicate **full** marks.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.
- 6) Assume suitable data if necessary.

#### SECTION - I

1.	a)	Draw gate drive circuit for GTO. Discuss switching characteristics and give comparison between SCR and GTO.	8
	b)	Explain and compare R and RC firing circuit for SCR. OR	8
2.	a)	Draw gate characteristics of SCR. Explain how value of gate voltage and gate current can be selected.	8
	b)	Why SCR is called as current controlled device ? Define Latching current and Holding current.	8
3.	a)	What are converters ? Explain with circuit diagram and waveforms working of $3\phi$ half controlled converter with highly inductive load. Deduce the equation for o/p voltage. Plot W/Fs at $\alpha = 60^{\circ}$ .	10
	b)	Explain single phase dual converter. Draw waveforms for output voltage at $\alpha = 60^{\circ}$ and $\alpha = 150^{\circ}$ . Comment on mode of operation of 1 $\phi$ dual converter at 60° and 150°.	8
4.	a) b)	With neat circuit diagram and all necessary waveforms explain the working of three phase fully controlled bridge converter feeding RLE load. Explain modes of operation. Write a note on selection of transformers and semiconductor devices for converters.	10 8
5.	a)	Describe the working of a two stage sequence control of voltage controllers for R load. What is the advantage of this controller over $1 \phi$ full wave voltage controller?	8
	b)	Discuss various technique adopted for protection of TRIAC and DIAC.	8

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6.	a)	Explain static on load tap changing of transformer using a. c. regulators. Draw output voltage waveform using two stages.	8
	b)	Explain four mode operation of TRIAC.	8
		SECTION – II	
7.	A)	Describe the switching characteristic of Power MOSFET and give applications with control requirements.	8
	B)	Give a comparison between MOSFET and IGBT. OR	8
8.	A)	Describe the basic structure of MCT. Give its equivalent circuit and explain the turn on and turn off process.	8
	B)	Explain output and transfer characteristics of IGBT.	8
9.	A)	Explain four quadrant chopper feeding RLE load in detail.	8
	B)	What is time ratio control in dc choppers ? Explain the use of TRC for controlling the output voltage in choppers.	8
10.	A)	Explain the principle of operation of step up chopper. Derive expression for output voltage	8
	B)	Draw a power circuit diagram for a type-A chopper. Show load voltage waveforms for $\alpha = 0.3$ and $\alpha = 0.8$ . For both these duty cycles, calculate : the average and rms values of output voltage in terms of source voltage.	8
11.	A) B)	What is a need for controlling the voltage at the output terminals of an inverter ? Describe and compare various methods employed for the control of output voltage of inverter. What is pulse width modulation ? Explain any one PWM technique in detail.	9 9
10	•	OR	
12.	A)	inverter.	8
	B)	Explain working of three phase six step voltage source inverter in 180° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in	
		each step.	10