

5E5041	Roll No. <u>15EEPE038</u>	[Total No. of Pages : <u>2</u> ]
	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px; margin: 5px;">5E5041</div> <b>B.Tech. V Semester (Main/Back) Examination, Nov./Dec. - 2017</b> <b>Electrical &amp; Electronics Engineering</b> <b>5EX1A Power Electronics</b> <b>EX, EE</b>	

Time : 3 Hours

Maximum Marks : 80  
 Min. Passing Main : 26  
 Min. Passing Back : 24

**Instructions to Candidates :**

*Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

**Unit - I**

1. a) Explain and draw the switching characteristics of the power IGBT. (8)
- b) Describe the various commutation methods of thyristor. (8)

**OR**

1. a) Explain and draw the switching characteristics of the power GTO. (8)
- b) Explain the constructional details and working of power MOSFET. (8)

**Unit - II**

2. a) Explain and draw the switching characteristics of SCR. (8)
- b) Explain various turn ON methods of thyristor. (8)

**OR**

2. a) Explain the series and parallel operation of SCR. (8)
- b) A SCR with a rating of 1000V and 200A are available to be used in a string to handle 60 KV and 1 KA. Calculate the number of series and parallel unit required in case of derating factor is
 

i) 0.1	ii) 0.2	(8)
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**Unit - III**

3. a) Describe working of a 1 -  $\phi$  full wave converter with RLE load through a waveform of a supply voltage, load voltage, load current and voltage across thyristor. Also derive the expressions for load voltage and output power. (8)

- b) A 1 -  $\phi$  half wave converter has resistive load  $20 \Omega$  input voltage  $230 \text{ V}$ ,  $50 \text{ Hz}$  with  $\alpha = 45^\circ$  Determine the -
- RMS value of output voltage
  - Power delivered to the load
  - Power factor
- (8)

OR

3. a) Explain the principle of 3- $\phi$  dual converter. (8)
- b) A 1 -  $\phi$  full wave converter has a RL load having  $L = 6.5 \text{ mH}$ ,  $R = 0.5 \Omega$  and  $E = 10 \text{ V}$ . the input voltage is  $V_s = 120 \text{ V}$  at (rms).  $60 \text{ Hz}$ . Determine -
- The load current  $I_{LO}$  at  $\omega t = \alpha = 60^\circ$
  - The average thyristor current  $I_A$
  - The RMS thyristor current  $I_R$
  - The RMS output current  $I_{RMS}$
  - The average output current  $I_{dc}$ .
- (8)

Unit - IV,

4. a) Explain pulse width modulation control technique of power factor improvement along with circuit diagram and waveform. (8)
- b) A 3  $\phi$ , M - 3 converter is operated from  $230 \text{ V}$ ,  $50 \text{ Hz}$  supply with load resistance  $R = 10 \Omega$ . An average output voltage of 50% of the maximum possible output voltage is required. Determine.
- Firing Angle
  - Average and RMS value of load current.
  - Rectification efficiency.
- (8)

OR

4. a) Describe the working principle of a single phase full wave semi converter with RL Load through the waveforms of supply voltage, load voltage, load current and voltage across thyristor. And also derive expressions of its. (8)
- b) Explain in detail the extinction angle control scheme for power factor improvements. (8)

Unit - V

5. a) What is the principle of operation of a step up chopper. (8)
- b) Explain the load commutated chopper along with relevant circuit diagram and waveform. (8)

OR

5. a) Derive the expressions for steady state maximum and minimum current for type A chopper. (8)
- b) Explain multiphase chopper along with relevant circuit diagram and waveform. (8)