

**B.Tech.****(SEM. VI) ODD SEMESTER THEORY  
EXAMINATION, 2014-15  
POWER ELECTRONICS****Time : 3 Hours****Max. Marks : 100**

- Note :** 1. Answer all the questions.  
2. All questions carry equal marks.

1. Attempt any four parts : (5 × 4 = 20)  
a. What are the characteristics of an ideal power switching device ?

**Ans.** Refer Q. 1.8, Page 1-9A, Unit-1.

- b. Explain the switching characteristics of a BJT.

**Ans.** Refer Q. 1.10, Page 1-11A, Unit-1.

- c. Find the number of thyristors each with a rating of 500V and 75 A required for each branch of a series parallel combination for a circuit for a total voltage and current rating of 7.5KV and 1 KA. Assume derating factor of 15%.

**Ans.** Refer Q. 2.13, Page 2-22A, Unit-2.

- d. Explain the significance of latching and holding currents.

**Ans.** Refer Q. 1.21, Page 1-26A, Unit-1.

- e. Explain the steady state and switching characteristics of MOSFET.

**Ans.** Refer Q. 1.13, Page 1-15A, Unit-1.

- f. Explain working of TRIAC.

**Ans.** Refer Q. 1.26, Page 1-31A, Unit-1.

2. Attempt any two parts : (10 × 2 = 20)

- a. What is DC chopper ? Describe the various types of chopper configuration with neat and appropriate diagrams.

**Ans.** Refer Q. 2(a), Page SP-2A, Solved Paper 2013-14.

- b. Discuss the two transistor model of a thyristor. Using this model, describe the various mechanisms of turning ON a thyristor.

**Ans.** Refer Q. 1.23, Page 1-28A, Unit-1.

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- c. Explain the resonant pulse commutation with the help of circuit diagram and waveforms. Explain the effect of accelerating diode.

**Ans.** Refer Q. 2.7, Page 2-10A, Unit-2.

3. Attempt any two parts :

(10 × 2 = 20)

- a. A single phase half controlled bridge operated from the 230 V, 50 Hz mains feeds a resistive load of 100 Ω. If the firing angle is 60° Calculate,
- Average output voltage
  - Rms output voltage
  - Total output power
  - DC output power
  - load current at instant of turn on

**Ans.** Refer Q. 3.2, Page 3-3A, Unit-3.

- b. What do you understand by dual converters ? Explain the operation of a 3 φ dual converter using circulating current mode of operation. How are firing angles of two converters controlled ?

**Ans.** Refer Q. 3.22, Page 3-32A, Unit-3.

- c. Discuss the working of 1 φ full wave AC-DC converter taking into account the effect of source inductance. Draw the output voltage waveform for firing angle of 30°.

**Ans.** Refer Q. 3.19, Page 3-26A, Unit-3.

4. Attempt any two parts :

(10 × 2 = 20)

- a. Describe the basic principle of working of 1 φ to 1 φ step down cycloconverter for both continuous and discontinuous conductions. Make the conduction of various thyristor also.

**Ans.** Refer Q. 4.12, Page 4-21A, Unit-4.

- b. Describe 1 φ AC voltage controller with inductive and resistive loads. Describe an expression for output voltages.

**Ans.** Refer Q. 4.6, Page 4-9A, Unit-4.

- c. Show that the fundamental rms value of per phase output voltage of low frequency for an  $m$  pulse cycloconverter is given by :

$$V_{or} = V_{ph} \left( \frac{m}{\pi} \sin \left( \frac{\pi}{m} \right) \right)$$

**Ans.** Refer Q. 4.15, Page 4-29A, Unit-4.

5. Attempt any two parts

(10 × 2 = 20)



- a. Discuss the working principle of a 1  $\phi$  series inverter. What are the advantages and disadvantages of series inverter ?

**Ans.** Refer Q. 4(b), Page SP-5A, Solved Paper 2013-14.

- b. Explain operation of a 3  $\phi$  bridge inverter employing 120° mode of operation. Draw waveforms of phase voltages and any one line voltage assuming star connected resistance load.

**Ans.** Refer Q. 5.4, Page 5-7A, Unit-5.

- c. The single phase quasi-square wave bridge inverter operates from a DC supply of 200 V at a frequency of 100 Hz and feeds a resistive load of 10  $\Omega$  calculate :

- Duration of the ON period if the rms value of the load voltage is 100 V.
- Peak supply current
- Average DC supply current.

**Ans.** Refer Q. 5.6, Page 5-14A, Unit-5.

