

Code No: **R31024**

**R10**

**Set No. 1**

**IIIB.Tech I Semester Supplementary Examinations, May - 2017**

**POWER ELECTRONICS**  
**(Electrical and Electronics Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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- 1 a) Explain the principle of operation of SCR. Also list the applications of SCR. [7M]  
b) Define and explain (i) Delay time, (ii) Rise Time, (iii) Spread time and (iv) Turn-on time of a thyristor. [8M]
- 2 a) With the help of a neat diagram, explain the two transistor analogy of an SCR. [8M]  
b) Describe the need for series and parallel operation of SCRs. [7M]
- 3 a) Explain with the help of neat power diagram and associated waveforms, the operation of a single-phase half-wave controlled converter with Resistive load. [10M]  
b) Define (i) Rectifier efficiency and (ii) Derating factor of a rectifier. [5M]
- 4 A single phase fully controlled bridge converter supplies an inductive load. Assuming that the output current virtually constant and is equal to  $I_d$ , determine the following performance measures if the supply voltage is 230V and if the firing angle is maintained at  $\pi/6$ . [15M]  
i) Average output voltage ii) Supply RMS current  
iii) Supply fundamental RMS current iv) Fundamental power factor  
v) Supply power factor
- 5 a) What is pulse number of a converter? What are six-pulse and twelve-pulse converters? Briefly explain. [6M]  
b) With a neat schematic diagram, explain the operation of a three-phase six-pulse converter. [9M]
- 6 a) What are cyclo converters? List their applications. [7M]  
b) A 3-phase heating load is fed from 415V, 3-phase, 50 Hz supply through (i) Traics (ii) Reverse connected thyristors. The load is 20kW. Find current and voltage ratings in each case. Assume a safety factor of 1.5 for both current and voltage. [8M]
- 7 a) What are choppers? Explain the time ratio control (TRC) of choppers. [8M]  
b) A chopper operating on TRC constant frequency principle is feeding a dc series motor having an armature resistance of 0.06 ohm and a field resistance of 0.03 ohm. The average circuit current is 15A and the chopper frequency is 500 Hz. The back emf of the motor is 100V. Find the periods of conduction and blocking. The chopper input is 200V. [7M]
- 8 a) What do you mean by voltage source and current source inverters? Explain the basic operation of a single phase voltage source inverter. [8M]  
b) What is pulse width modulation? What is modulation index? Explain. [7M]

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