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**Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019**

**Power Electronics**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
atleast TWO questions from each part.**

**PART – A**

- 1 a. Explain briefly the concept of power electronics. (04 Marks)  
b. With help of neat block diagram, explain the functional elements of power electronics system. (08 Marks)  
c. Explain the different types of power electronics converters with applications. (08 Marks)
- 2 a. Draw and explain the operation of cross-sectional structure and switching characteristics of power MOSFET. (10 Marks)  
b. With the help of neat structural diagram, explain the switching and static characteristics of IGBT. (10 Marks)
- 3 a. With the help of neat diagram, explain the two transistor analogy of an SCR. (10 Marks)  
b. With appropriate diagram and waveform explain R-Firign circuit. What are the limitations of R-firing circuit. (10 Marks)
- 4 Define commutation of SCR. What are the different classes of forced commutation methods? Explain class B and C commutation methods with appropriate diagram and waveforms. (20 Marks)

**PART – B**

- 5 a. Explain the effect of freewheeling diode in details. Also, justify the statement "Free wheeling diode improves the power factor of the system" (10 Marks)  
b. Explain the operation of 3- $\phi$ , half wave controlled converter with resistive load, sketch the associated waveforms. (10 Marks)
- 6 a. Explain the Time Ratio Control [TRC] and Current Limit Control [CLC], and control strategies used for chopper. (10 Marks)  
b. A chopper, circuit is operating on TRC principle at a frequency of 2KHz on a 220V DC supply. If the load voltage is 170V, compute the conduction and blocking period of thyristor in each cycle. (10 Marks)
- 7 a. Explain the operation of 1 -  $\phi$  bridge inverter with the help of voltage waveforms. Derive the expression for rms value of output voltage. (10 Marks)  
b. Explain the working of 3 -  $\phi$  inverter with circuit diagram and waveforms. (180° mode of conduction). (10 Marks)
- 8 a. Describe the operation of single phase full-wave AC voltage regulator with the help of voltage and current waveforms. Also derive the expression for average value of output voltage. (10 Marks)  
b. A 1- $\phi$  half wave AC regulator feeds power to a resistive load of 6 $\Omega$  form 230V, 50Hz source. The firing angle of SCR is  $\pi/2$ . Calculate :  
i) The RMS value of output voltage  
ii) The input power factor pf  
iii) The average input current. (10 Marks)

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