USN | | | | | | | | | | **10EE45**

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-ϕ, 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 - ϕ 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 - ϕ 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–ϕ half wave AC regulator feeds power to a resistive load of 6Ω 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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