

Power Electronics

P. Pages : 2

Time : Three Hours



NKT/KS/17/7392

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.

1. a) What are the different methods for Turning of OFF SCR? Explain class-B in Detail with ckt Dia and operation. 7
- b) Define following terms in connection with SCR. 7
- a) Peak Inverse Voltage.
 - b) Critical rate of rise in voltage.
 - c) Voltage safety factor.
 - d) Latching current.
 - e) Holding current.

OR

2. a) What is the necessity of connecting SCR in series? What are the problem associated with series connection? How they are eliminated? 7
- b) Calculate the number of SCR's each with rating of 500V, 75A required in each branch of a series and parallel combination for a circuit with the total voltage and current rating of 7.5kV and 1000A. Assume derating factor of 14%. 6
3. a) Draw and explain the operation of cross-sectional structure of power MOSFET. 6
- b) Briefly discuss the gate derive design consideration of the MOSFET. 7

OR

4. a) Draw and explain the operation of A-C. Phase control using Triac-Diac combination with o/p voltage waveform. 7
- b) Explain the operation of IGBT on the basis of: 7
- a) Creation of an Inversion layer.
 - b) Conductivity modulation of the Drift layer.

5. a) Describe the working of single phase fully controlled bridge converter in the following two modes. 7
 i) Rectifying mode ii) Inversion Mode.
 b) A voltage source $e=100 \sin 377t$, supplies a resistive load of 100Ω through a thyristor, which performed half wave controlled Rectifier, calculate, the average power in the load, if the firing angle is fired at 45° with respect to the supply voltage waveform. 6

OR

6. a) Explain the operation of a three phase half controlled bridge converter with associated waveforms. 7
 b) Calculate the average output voltage of a three phase half controlled bridge operating with triggering angle of $\pi/2$ and connected to three phase a.c. Supply of 400V, 50Hz. The load current I_d is assumed to be continuous. 6
7. a) Enlist the limitation of cycloconverter, Explain the operation of 3ϕ to 3ϕ cycloconverter with $\alpha = 30^\circ$. 7
 b) Explain SCR phase controlled converter operation to control the speed of D. C. Motor. 6

OR

8. a) Describe and explain the power factor Improvement Methods in controlled Rectifier. 7
 b) Derive $\alpha_1 + \alpha_2 = 180^\circ$ in relation with dual converter. 6
9. a) Explain the operation of step-up chopper and also Derive the o/p voltage Expression. 7
 b) Enlist the limitation of Basic series Inverter, How they are Eliminated. 7
10. a) Explain the operation of Two-quadrant Chopper (class-c) in detail with o/p waveforms. 7
 b) Write a note on Resonant Converter Operation. 7
11. a) Explain the operation of 3ϕ bridge inverter with star connected Resistive load for 180° mode of operation and o/p phase voltage waveform. 7
 b) Enlist the o/p voltage control Technique of Inverter. Explain SPWM in detail. 6

OR

12. a) Differentiate between VSI and CSI. 6
 b) Explain the operation of 3ϕ bridge inverter with star connected load for 120° mode of operation and o/p phase and line voltage waveform. 7
