

Power Electronics

P. Pages : 2

Time : Three Hours



TKN/KS/16/7480

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. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.

1. a) The parallel capacitor class C complementary commutation has. 7
Load resistance $R_1 = R_2 = 5 \text{ ohm}$ Capacitance $C = 10 \mu\text{f}$ and Supply. Voltage $V_s = 100 \text{ V}$.
Determine the circuit turn off time.

b) Describe how the SCR can be protected against. i) High voltage ii) High current iii) High dv/dt iv) High di/dt . Draw SCR circuit incorporating all protective devices for taking of all above extremities. 6

OR

2. a) Draw and explain two transistor analogy of SCR. Also derive the expression for anode current. 7

b) Calculate the number of SCR each with a rating of 500 V and 75 Amp. required in each branch of series parallel combination for a circuit with a total voltage and current rating 7500 volt and 1000 Amp. Assume a derating factor of 14%. 6

3. a) How IGBT is superior to MOSFET and BJT Justify. 7

b) Draw the circuit diagram of single phase a.c. voltage regulator using TRIAC. Also explain the working with all relevant waveforms. 6

OR

4. a) What are the drawbacks of Resistive triggering circuit. How it can overcome using R – C triggering circuit. Explain the working of R – C triggering circuit with neat circuit diagram and all relevant waveforms. 7

b) Design the UJT Relaxation oscillator with following parameters $h=0.45$, $V_v=14$, $I_v=10\text{mA}$, $I_p = 25 \mu\text{A}$, $V_p = 16 \text{ V}$. Also calculate the range of output frequencies that gives proper turn on and turn off the UJT. 6

5. a) What is line commutation. Explain the working of single phase line commutated inverter with the help of suitable waveform. State its application. 7
- b) Describe the operation of Three phase. Six pulse bridge converter. Draw the waveform across any one SCR and load with $\alpha = 30^\circ$. 7
- OR**
6. a) Explain the effect of source inductance on the operation of single phase fully controlled bridge rectifier with the help of suitable waveforms. Also derive the expression of average value of output voltage. 7
- b) Describe the operation of Three phase converter. Draw the waveform across any one SCR and load with $\alpha = 30^\circ$. 7
7. a) Draw and explain the operation of single phase cycloconverter to get the output frequency 1/3 of input frequency. Also draw all relevance waveforms. 7
- b) Draw and explain the operation of separately excited DC motor using line commutated converters. 6
- OR**
8. a) Draw and explain the operation of Three phase dual converter. Also compare circulating and non circulating type of Dual converter. 7
- b) Write a technical note on power factor improvement methods. 6
9. a) Describe the principle of step down chopper. Derive the expression for the average output voltage in terms of input voltage and duty cycle. Discuss control strategies. 7
- b) Explain Basic series inverter with the help of circuit diagram and relevant waveforms. 6
- OR**
10. a) What are the drawback of basic series inverter. How it is overcome by modified improved series inverter. Explain modified improved series inverter with the help of circuit diagram. 7
- b) Explain multiphase chopper with the help of circuit diagram and relevant waveforms. 6
11. a) Explain 3 phase bridge inverter in 180° mode feeding 3 phase balanced star connected load. Draw phase and line voltage waveforms. 7
- b) Explain single pulse width modulation technique with mathematical analysis. 7
- OR**
12. a) Explain the working of 3 phase current source inverter with neat circuit diagram. 7
- b) Write a technical note on output voltage control methods in inverters. 7
