



Regulation R17

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 1P6BB

B.Tech III Year II Semester Supplementary Examinations, January 2023 POWER ELECTRONICS

(EEE)

Maximum Marks: 70

10-01-2023

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Write the SCRs applications?
- 2 What are the advantages of forced commutation for ac-dc converters?
- 3 Define load power factor.
- 4 What is effect of source inductance in converters?
- 5 What are the steps involved in determining the output voltage waveforms of three phase bidirectional controllers?
- 6 What are the advantages and disadvantages of cycloconverters?
- 7 Define duty cycle.
- 8 Draw the output voltage waveform of single phase AC chopper.
- 9 How can a PWM control signal be obtained using a carrier wave and reference wave with the help of diagram.
- 10 What is current source inverter (CSI) & voltage source inverter (VSI)?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 a) What are the problems associated with firing of parallel connected SCRs? Draw and explain circuit for firing of parallel connected SCRs. 5
b) Draw and explain the necessity of static and dynamic equalizing circuit for series connected SCRs? Derive relations used for determining the values of shunt resistor R and capacitor C in this circuit. 5

OR

- 12 a) Draw the circuit of class-B commutation circuit. Explain how thyristor is commutated in class-B converter. What are disadvantages of this commutation circuit? 5
b) Draw the circuit of line commutation circuit and explain its operation 5
- 13 Explain the operation of single phase bridge inverter with the help of load voltage and load current waveforms for R-L Load. 10

OR

- 14 Explain the operation of three phase, half wave controlled converter with resistive load and inductive load. Sketch the associated waveforms also. 10

- 15 a) Describe the operation of a single phase AC voltage controller with a neat circuit diagram and output wave forms with respect to source voltage waveforms at $\alpha = 60^\circ$ for R-load. 5
- b) A single phase voltage controller has input voltage of 230 V, 50 Hz and a load of $R = 15 \Omega$. For 6 cycles on and 4 cycles off, determine. (i) rms output voltage (ii) input pF and (iii) average and rms thyristor currents. 5
- OR
- 16 Describe the working principle of 1 – phase to phase step-down midpoint type cyclo-converter with associated waveforms for R load. 10
- 17 Explain working principle of Jones's chopper with necessary circuit diagram and waveforms. 10
- OR
- 18 a) Explain in detail working principle of step up - down chopper. 5
- b) A chopper fed from a 200V DC source, is working at a frequency of 50 Hz and is connected to an RL load of $R = 4\Omega$ and $L = 30 \text{ mH}$. Determine the value of duty cycle at which the minimum load current will be (i) 5 A (ii) 10 A 5
- 19 a) Draw the circuit diagram of a single phase half bridge inverter and explain its operation. 5
- b) A three phase bridge inverter delivers power to a resistive load from a 400V DC source. For a star connected load of 8Ω per phase, determine RMS value of load current and RMS value of thyristor current for 120° conduction mode of operation. 5
- OR
- 20 Describe the operation of 3-phase bridge inverter circuit diagram with resistive load in 120° conduction mode 10