



Regulation R18

Subject code: 2P5BB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, January 2023

POWER ELECTRONICS

(EEE)

Maximum Marks: 70

09-01-2023

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 What are the different methods to turn on the thyristor?
- 2 Define holding current.
- 3 What is the effect of connecting free wheeling diode across R-L load in controlled rectifiers?
- 4 Write down general expression for average voltage of single phase fully controlled rectifier.
- 5 What are applications of ac voltage controllers.
- 6 What are the applications of dc chopper?
- 7 What is meant inverter?
- 8 What are the applications of inverter?
- 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) Explain the basic structure and operation of power IGBT. 5
b) Discuss the static characteristics and modes of operation of SCR. 5
- 12 a) Explain the resistance firing circuit with the help of circuit diagram and waveforms. 5
b) Explain the turn on and turn off characteristics of the SCR. 5
- 13 Explain the operation of single-phase bridge converter with the help of load voltage and load current waveforms for R-L Load. 10
- 14 Explain the operation of three phase half wave rectifier with R load. Derive the expression for (i) Average output voltage (ii) RMS value of output voltage 10

- 15 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. 10
- OR
- 16 Explain the operation of single-phase AC voltage controller for R load with the help of neat circuit diagrams and necessary waveforms. 10
- 17 A square-wave inverter has a dc source of 125 V, an output frequency of 60 Hz, and an RL series load with $R = 20 \Omega$, and $L = 25 \text{ mH}$. Determine (i) an expression for load current, (ii) rms load current, and (iii) average source current. 10
- OR
- 18 Explain the operation of a single phase bridge inverter for RL loads with the help of neat circuit diagrams and necessary waveforms. 10
- 19 a) What is pulse width modulation? list the various PWM techniques 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