



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code:3P5BA

B.Tech V Semester Regular Examinations, January 2023

POWER ELECTRONICS (Electrical and Electronics Engineering)

Maximum Marks: 70

Date:06.01.2023 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 which carries 10M.
 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 Define Latching and Holding currents.
- 2 Compare IGBT and BJT.
- 3 Write the advantages of three phase rectifiers over single phase rectifiers.
- 4 What is semi converter? Write an expression for average output voltage of single-phase semi converter feeding RL load.
- 5 The average output voltage of a chopper is 300V and input to the chopper is 200V. If the switching frequency of the chopper is 10KHz, determine the on time of the chopper.
- 6 What is ac voltage controller?
- 7 Compare series and parallel inverters.
- 8 Write about sinusoidal pulse width modulation.
- 9 What is 180° conduction mode in inverters. How many switching devices will be in conduction at any instant of time
- 10 List out few salient features of Current source Inverter (CSI).

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 With the help of neat circuit diagram, explain the static characteristics of SCR by explaining the following modes of operation (a) Reverse Blocking Mode (b) Forward Blocking Mode and (c) Forward Conduction Mode. [10M]

OR

- 12 a) Explain UJT triggering circuit with waveforms. [5M]
b) Draw and explain output characteristics of n channel enhancement MOSFET. [5M]
- 13 a) Explain the operation of 1-phase half wave controlled rectifier feeding R load. [5M]
b) A single phase 230V, 50Hz source is feeding an RL load with $R=50\Omega$ and $L=100\text{mH}$ through a single phase full-wave rectifier. Determine the average output voltage and average output current for firing angle of 60° . [5M]

OR

- 14 Explain the operation of 3-phase fully controlled rectifier feeding RL load with neat waveforms. Derive an expression for average output voltage. [10M]

- 15 a) Define chopper. Explain time ratio control in detail. [5M]
b) Explain the operation buck converter with neat waveforms. [5M]

OR

- 16 a) Define ac voltage controller. With neat circuit diagram and waveforms explain 1-phase ac voltage controller feeding R Load. [5M]
b) Explain the operation of 1-phase stepdown cycloconverter feeding RL load. [5M]
- 17 a) Discuss the operation of 1-phase parallel inverter with neat waveforms. [5M]
b) Compare unipolar and bipolar sinusoidal pulse width modulation techniques used in inverters. [5M]

OR

- 18 a) What is series inverter. Explain its operation with neat waveforms. [5M]
b) A single phase full bridge inverter employing transistors is fed from 220V dc and output frequency is 50Hz and load is resistance with $R=6\Omega$ and $L=30\text{mH}$. calculate (i) RMS value of the fundamental output voltage (ii) RMS value of fundamental component of output voltage. [5M]
- 19 With a neat circuit diagram and waveforms explain the operation of 3-phase voltage source inverter with 180° conduction mode. Indicate the switching devices in each interval and write the expression for line voltage. [10M]

OR

- 20 a) Explain the operation of current source inverter. [5M]
b) Discuss the advantages of CSI over VSI. [5M]