R18 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 2P5BB

B.Tech V Semester Supplementary Examinations, June 2022

POWER ELECTRONICS

(ELECTRICAL & ELECTRONICS ENGINEERING)

Maximum Marks: 70

Date:04.07.2022 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 is meant by holding current and latching current in SCR?
2 Explain in detail various voltage ratings and current ratings of a thyristor.
3 Define ripple factor input displacement factor, total harmonic distortion
4 What is meant by extinction angle and conduction angle?
5 Explain the various control strategies for varying duty cycle.
6 Define the ac voltage controllers and give its application.
7 Define Load commutation.
8 What are the methods of voltage control within the inverter?
9 Define the function of inverter and its applications.
10 How can a PWM control signal be obtained using a carrier wave and reference wave with the help of diagram.

Part-B

Answer All the following questions. (10M X 5=50Marks)

11 a) Explain the R firing circuit of SCR. [5M]

b) Explain the operation of IGBT with VI and switching characteristics. [5M]

OR

12 Explain the dynamic turn on and turn off characteristics of SCR? [10M]

13 Explain the operation of three phase half wave-controlled converter with R-load. [10M]

OR

14 Explain the operation of single-phase half controlled bridge converter with RL loads. [10M]
Describe in detail with discontinuous conduction mode with associated waveforms.

15 a) Derive an expression for output voltage of a buck dc-dc converter operating under CCM. [10M]

b) Obtain the input-output voltage and current relation as a function of duty ratio [5M]

for a Buck-Boost dc-dc converter in continuous conduction mode. [5M]

OR

16 a) Explain the operation of a single-phase ac voltage controller with R–load and derive all necessary equations. [5M]

b) For a single-phase AC voltage controller feeding resistance load of 10 ohms. The rms of i/p voltage is 120V at 60Hz . The delay angle of thyristor is 60^0. Calculate the value of a). the rms o/p voltage b). Input power factor. [5M]

17 a) Explain the operation of single-phase bridge inverter with the help of load voltage and load current waveforms for RL Load. [6M]

b) Explain the sinusoidal pulse width modulation used in single phase inverter and draw its waveform. [4M]

OR

18 A single-phase bridge inverter fed from 200 V dc, is connected to an RL load of $R = 9\ \Omega$ and $L = 0.04$ H. Determine the power delivered to the load in case the inverter is operating at 50 Hz with square wave output. [10M]

19 a) Describe the operation of 3-phase bridge inverter circuit diagram with resistive load in 120^0 conduction mode. [7M]

b) Compare voltage source and current source inverters. [3M]

OR

20 A 3-phase bridge inverter is operated in 180^0 conduction mode. Derive output line voltage and phase voltage expression. [10M]