



B.Tech V Semester Regular/Supplementary Examinations, December 2021

POWER ELECTRONICS
(Electrical and Electronics Engineering)

Maximum Marks: 70

Date: 03.01.2022 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 the power diode?
- 2 List various forced commutation techniques used for turn off of SCR.
- 3 What is the function of freewheeling diodes in controlled rectifiers?
- 4 Give an expression for average output voltage of single phase semi-converter.
- 5 How output voltage of chopper depends on duty cycle?
- 6 What are the applications of AC voltage controllers?
- 7 Indicate different performance parameters of inverter.
- 8 State different methods of voltage control inverters.
- 9 Define modulation index and indicate its importance.
- 10 Differentiate voltage source and current source inverter.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 a) What is the need for commutation in thyristor circuits. Enumerate the various commutation techniques used for thyristor. [4M]
b) Give the constructional details of SCR with the help of schematic diagram and its static characteristics. [6M]

OR

- 12 a) For resistive firing circuit show that firing delay angle is proportional to the variable resistance. [5M]
b) Give a comparison between power IGBT and MOSFET. [5M]
- 13 a) A single-phase half wave SCR circuit feeds power to a resistive load. Obtain the expressions for average and rms load voltages in terms of source voltage and firing angle. [6M]
b) A resistive load of 10Ω is connected through a single-phase full wave SCR circuit to 220V, 50Hz. Calculate the power delivered to load for a firing angle of 60° . [4M]

OR

- 14 Draw the output voltage waveform of 3-phase fully controlled rectifier for a firing angle of 30° . Indicate firing sequence. Also derive expression for output voltage. [10M]

- 15 a) Describe the principle of step-up chopper and derive the average output voltage. [6M]
b) For a step-down chopper with voltage of 100V, load resistance of 10Ω . For a duty cycle of 0.4, calculate average and rms values of output voltage. [4M]

OR

- 16 Derive the expression for rms value of output voltage of single phase fully controlled ac controller. [10M]

- 17 Explain the operation of single-phase bridge inverter supplying R-L load. Draw the output voltage and current waveforms. [10M]

OR

- 18 a) Explain Sinusoidal pulse width modulation applied to single phase inverter. [6M]
b) A single-phase half bridge inverter connected to 230V DC source feeds a resistive load of 10Ω . Determine (a) RMS output voltage (b) fundamental RMS output voltage. [4M]

- 19 With the help of waveforms, Explain the operation three phase bridge inverter for 120° mode of operation. Draw the timing diagrams also. [10M]

OR

- 20 Analyse the operation of Three phase voltage source inverter with 180° mode of operation for balanced star connected load. Also draw the phase voltage and line voltage waveforms. Also determine the expressions for line and phase voltages. [10M]