

**III B. TECH I SEMESTER REGULAR EXAMINATIONS, FEB - 2022**  
**POWER ELECTRONICS**  
**(Electrical & Electronics Engineering)**

Time: 3 Hours

Max. Marks: 60

Note: Answer ONE question from each unit ( $5 \times 12 = 60$  Marks)

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UNIT-I

1. a) Describe the different modes of operation of a thyristor with the help of its V-I characteristics. [6M]
- b) Draw and explain the transfer and output characteristics of MOSFET. [6M]

(OR)

2. a) Compare the characteristic features of MOSFET and IGBT. [6M]
- b) Mention the importance of snubber circuit which is connected across SCRs. [6M]

UNIT-II

3. a) Explain the operation of a single-phase half wave converter for R-Load with neat circuit diagram and necessary waveforms. Also derive the output average voltage and current for  $\alpha = 30^\circ$ . [6M]
- b) Explain the operation of single phase fully controlled converter with RL loads. Derive the output voltage and current expressions for firing angle of  $45^\circ$ . [6M]

(OR)

4. a) Derive an expression for i) average load voltage ii) average load current iii) RMS load voltage of single phase half-controlled converter with inductive load. [6M]
- b) A single-phase semi-converter delivers power to RL load with  $R = 5\Omega$ ,  $L = 10\text{mH}$ . The A.C. supply voltage is 230V, 50Hz. For the continuous conduction mode, find the average value of output voltage and current for the firing angle of  $45^\circ$ . [6M]

UNIT-III

5. a) Explain the operation of three phase half-controlled converter with R-load. [6M]
- b) Explain the operation of three-phase dual converter with circulating current. [6M]

(OR)

6. a) Explain the operation of three phase fully controlled bridge [6M]  
converter with RL loads.
- b) A 3 phase fully controlled bridge rectifier is operating from a [6M]  
400V, 50Hz supply. The load is highly inductive and current  
constant and continuous. Find the load voltage at firing angle of  
 $45^\circ$ .

UNIT-IV

7. a) With the help of circuit diagram and waveform explain the [6M]  
operation of boost converter and derive the equation of output  
voltage.
- b) Derive the expression for output voltage of a buck-boost [6M]  
converter, showing relevant waveforms.

(OR)

8. a) Discuss the working of a single-phase bridge type cyclo [6M]  
converter with R load and for continuous operations with  
relevant output waveforms for  $f_0 = 1/3f_s$ .
- b) Explain the operation of a single-phase AC voltage regulator [6M]  
with RL -load and derive all necessary equations.

UNIT-V

9. a) Explain the operation of a single-phase full bridge inverter for [6M]  
R load with the help of neat circuit diagram and necessary  
waveforms.
- b) A three-phase bridge inverter is operated in  $180^\circ$  conduction [6M]  
mode. Derive output line voltage and phase voltage expression.

(OR)

10. a) Briefly explain about Multiple Pulse PWM inverter with the help [6M]  
of neat circuit diagram and necessary wave forms.
- b) With the help of circuit diagram explain the working of current [6M]  
source inverter.

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