



Power Electronics (1080)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figure to the right indicates full marks.
6. Assume suitable data if necessary.
7. Use of non-programmable calculator is allowed.

UNIT – I

1. Attempt **any two**.
 - a) i) Explain V-I characteristics of SCR. **5**
ii) Explain Rc triggering of SCR with neat circuit diagram and waveforms. **5**
 - b) Draw structure of N-MCT and explain its operation with the help of equivalent circuit. **10**
 - c) Explain the working of GTO and derive expression for turn off gain. **10**

UNIT – II

2. Attempt **any two**.
 - a) A 1- ϕ fully controlled rectifier supplying a dc output voltage of 125V. The load resistance is 10Ω . The supply voltage is 230V, 50Hz. Calculate **10**
 - i) RMS load voltage,
 - ii) Average power,
 - iii) RMS output power,
 - iv) Efficiency,
 - v) Transformer utilization factor (TUF).
 - b) Explain operation of Half controlled Bridge Rectifier with Inductive load. **10**
Derive expression for average and rms load voltage.
 - c) Draw and explain 3- ϕ Half controlled rectifier with inductive load, Draw **10**
load voltage waveform for $\alpha = 30^\circ$ & 60° .

UNIT – III

3. Attempt any two.

- a) In step up dc-dc converter, V_d varies from 6V to 14V. The output voltage, $V_o = 20V$. If $f_s = 25$ kHz and output power $P_o \geq 5W$. Calculate L_{min} that will keep the converter operation in continuous conduction mode. **10**
- b) Explain the working of full bridge dc-dc converter. Draw waveform and derive the expression for output voltage. **10**
- c) Draw Block schematic of switch mode power supply (SMPS). Explain voltage control and current Limiting control of SMPS. **10**

UNIT – IV

4. Attempt any two.

- a) A single phase Half Bridge inverter has a resistive load of 10Ω and dc input voltage of 80V. Find **10**
 - i) Output voltage.
 - ii) Fundamental component of output voltage.
 - iii) Output power.
 - iv) Ratings of each switch.
- b) Describe the operation of 3- ϕ bridge inverter for 180° conduction. Draw phase and line voltage waveform. **10**
- c) Explain sinusoidal PWM switching of 1- ϕ Half bridge dc-ac inverter. Derive expression for output voltage. **10**

UNIT – V

5. Attempt any two.

- a) Explain the operation of 1- ϕ AC controller with inductive load (full wave) and derive expression for output voltage. **10**
- b) Discuss the different speed control method of DC motor. Explain any one with neat diagram and waveform. **10**
- c) A – 1- ϕ Half wave ac voltage controller has a resistive load of $R=10\Omega$ and input voltage is $V_s = 120V$, 50 Hz. The delay angle is $\alpha = \pi/2$. Determine : **10**
 - i) RMS load voltage.
 - ii) Input power factor.
 - iii) Average current of thyristor.
 - iv) RMS current of thyristor.
