

Seat
No.

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मध - 031

Power Electronics (1080)

P. Pages : 4

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet 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. Attempt **any two** question from each unit.
5. Assume suitable data wherever necessary.
6. Figure to right hand indicate marks.

UNIT - I

1. a) A UJT relaxation oscillator is designed to trigger SCR with following data. 10

$I_P = 100\mu\text{Amp}$, $V_P = 15.72\text{ volt}$, $V_D = 0.1\text{ volt}$, $V_V = 1.0\text{ volt}$, $I_V = 4\text{ MA}$,
 $R_{BB} = 5\text{ k}\Omega$, $\eta = 0.63$, $C = 0.047\mu\text{F}$

Calculate :

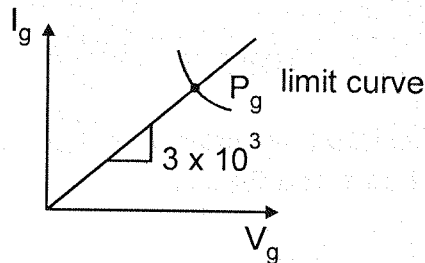
a) V_{BB}

b) R_2

c) F_{\min}

d) F_{\max}

- b) If $V_g - I_g$ characteristics of SCR is as shown in below 10



Calculate gate source resistance required if

$V_g = 10\text{ volt}$, $P_g = 0.012\text{ watt}$, $V_{gk} = 2\text{ volt}$.

- c) With help of two transistor analogy for GTO show that turn off gain

$$\beta_{\text{off}} = \frac{\alpha_2}{(\alpha_1 + \alpha_2 - 1)}$$

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UNIT - II

2. a) 1ϕ fully controlled converter supplies an inductive load Assume $I_L = 10 \text{ A}$, continuous and ripple free if $V_S = 230 \text{ volt}$, 50 Hz calculate.

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- i) Average O/P voltage.
- ii) Supply RMS current.
- iii) Supply fundamental RMS current.
- iv) Fundamental power factor.
- v) Supply power factor.
- vi) Harmonic factor.

- b) Explain working of 3ϕ fully controlled converter with RL load. Draw O/P voltage and current wave form for $\alpha = 0^\circ, 30^\circ, 60^\circ, 90^\circ$.

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- c) i) Explain any five performance factors of line commutated converter.
- ii) Explain Role of free wheeling diode ' F_D ' in 1ϕ fully controlled converter with RL load.

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UNIT - III

3. a) Explain necessity of electrical isolation, with help of neat block diagram explain electrical isolation in feedback loop.

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- b) Write a short note on :

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- i) Current mode control is SMPS.
- ii) Voltage feed forward control is SMPS.

- c) In a step-up chopper consider all components to be ideal Let $V_d = 8 - 16$ volt, $V_D = 24$ volt (Regulated) $F_S = 20\text{kHz}$ $C = 470\mu\text{F}$. Calculate values of L_{\min} that keep chopper in continuous conduction mode if $P_o \geq 5$ watt. 10

UNIT - IV

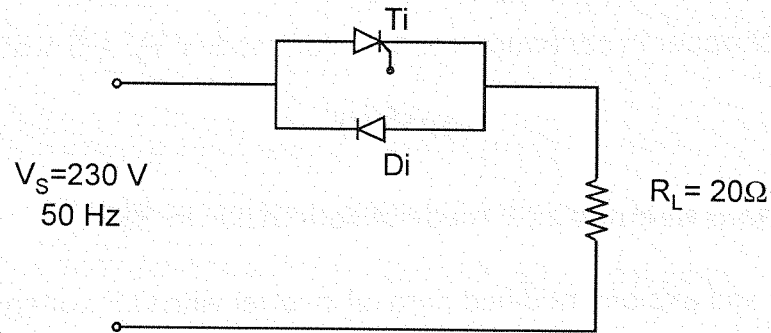
4. a) i) Compare 180° and 120° mode of conduction in 3ϕ VSI. 5
- ii) Draw and explain modified parallel inverter with O/P voltage waveform. 5
- b) Explain working of 3ϕ bridge VSI for 180° conduction mode. Also draw O/P phase & line voltage waveform. 10
- c) $1-\phi$ SCR full bridge inverter has a load resistance of 2.5Ω and I/P voltage $V_S = 50$ volt calculate. 10
- a) RMS O/P voltage at fundamental frequency.
- b) O/P power.
- c) Average and peak current of SCR.
- d) Total Harmonic distortion.
- e) PIV of SCR.

UNIT - V

5. a) Explain how speed of DC motor is controlled by 1ϕ fully converter. Draw O/P voltage and current waveform. 10
- b) Explain needs & applications of UPS. Draw and explain block diagram of on line UPS. 10

- c) 1 ϕ AC voltage controller is as shown in fig. for $\alpha = \pi/3$

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Calculate :

- Average RMS O/P voltage.
- Input power factor.
- Average I/P current.
- Average current Rating of SCR.
- RMS current Rating of SCR.
