

POWER ELECTRONICS (6X403)

Question Bank Cum Assignment **

Unit-I

1. Attempt the following.

Marks-2 OR 3

- a) List three features of IGBT.
- b) Define (i) Latching current and (ii) Holding current. (iii) ON state voltage of SCR.
- (c) Name any Three triggering devices used for triggering SCR.
- (d) State any three advantages of IGBT.
- (e) List three applications of TRIAC.
- (f) Draw the symbols of (i) SCR (ii) DIAC (iii) SBS
- (g) State advantages of power transistor (any three)
- (h) Draw the symbol of MOSFET, IGBT & GTO
- (i) Draw the structural diagram , Characteristics and symbol of SCR

2. Attempt any Three/Four :

Marks-4

- (a) State the advantages and applications of GTO.
- (b) Draw V-I characteristics of DIAC. Is DIAC equally sensitive in both the directions ? Give two applications of DIAC.
- (c) Draw the two transistor model of SCR and explain it.
- (d) Compare power BJT, power MOSFET and IGBT (any four points).
- (e) Describe LASCR. Give its industrial applications.
- (f) Draw V-I characteristics of PUT and describe the role of its operating regions.
- (g) Draw labelled layer diagram of N-Channel IGBT. Draw its V-I characteristics.
- (h) State one application each for

- (i) SCR (ii) PUT
- (iii) TRIAC (iv) GTO

- (f) State any two features of power MOSFET. Which makes it suitable for medium power applications ?
- (g) Sketch equivalent circuit of SCR using BJT. Describe its working principle.
- (h) Differentiate SCR and TRIAC with respect to
 - (i) symbol, (ii) layered diagram, (iii) operating quadrant, (iv) application.
- (i) Draw constructional diagram of GTO and state its operating principle.
- (j) Draw VI characteristics of power transistor. Label different regions.
- (k) Draw symbol and characteristics of DIAC and SUS.
- (l) Draw the layer diagram of PUT. With neat circuit diagram, describe its working as relaxation oscillator.
- (m) Draw the labelled constructional diagram of N-channel IGBT.
- (n) State two applications each for (i) SCR and (ii) PUT.
- (o) Explain the secondary breakdown in power BJT and how it can be avoided ?
- (p) Draw and explain the VI characteristics of DIAC.
- (q) Compare SCR & TRIAC. (any four points)
- (r) Draw and explain the VI characteristics of power transistor.
- (s) Draw and explain the VI characteristics of UJT.
- (t) Draw and explain the VI characteristics of SCR.

- (u) Draw the construction of GTO & explain the working principle.
- (v) Draw the symbol & vertical structure of power transistor and explain.
- (w) Draw and explain the two transistor analogy of SCR.
- (x) Describe the construction of IGBT.
- (y) Define holding current and latching current. State their typical values.
- (z) Draw the characteristics of power BJT. Explain Quasi-saturation.
- (za) Draw the characteristics and explain the working of SCS.
- (zb) Draw the structural diagram and symbol of GTO. Describe its working.
- (zc) State the types of power MOSFETS. Explain the working of any one type with a constructional diagram.
- (zd) Compare SCR & TRIAC with any four points.
- (ze) Compare 'Power BJT' with 'Power MOSFET' for their performance factor, construction and area of applications.
- (zf) Explain the working of "PUT" with relevant diagrams. Why it is called programmable ?
- (zg) Draw the structure and symbol of SUS. State the difference between SUS & PUT.

Unit-II

1. Attempt the following.

Marks-2 or 3

- (a) Name any three triggering devices used for SCR.
- (b) Define firing angle and conduction angle.
- (c) List different turn-on methods of SCR.
- (d) List different methods of triggering of SCR.

2. Attempt any Three / Four:

Marks-4

- a) Explain dv/dt turn on method of an SCR.
- b) State different trigger methods and describe R-triggering method for SCR with circuit diagram and waveforms.
- c) Compare R-triggering and RC-triggering of SCR on the basis of (i) circuit diagram, (ii) firing angle, (iii) cost, (iv) average output voltage.
- d) Explain SCR triggering using UJT with neat circuit diagram.
- e) Draw the neat block diagram of gate triggering. State the advantages of gate triggering.
- (f) Explain RC triggering circuit with neat circuit diagram & waveforms.
- (g) Draw the circuit diagram of R- triggering. Explain the working with necessary waveforms.
- (h) Define firing angle. Explain the method of phase control technique.
 - (i) Explain pulse triggering of SCR, with a neat circuit diagram and necessary waveforms.

(j) Name any four triggering devices. Draw the characteristics of “DIAC”.

Unit-III

1. Attempt the following.

Marks-2 or 3

- a) Define commutation. What is the meaning of natural commutation ?
- b) State difference between forced commutation and natural commutation. (any 3 points)
- c) Define the term commutation of SCR.

2. Attempt any Three / Four:

Marks-4

- a) Describe the working of Class-B commutation with neat circuit diagram.
- b) List various forced commutation methods. Explain self commutation by resonating load.
- c) Compare natural and forced commutation(Any four points)
- d) Explain class C commutation with circuit diagram.
- e) Draw circuit diagram of single phase half bridge inverter. Explain its working with output voltage waveforms.
- (f) State the need of Inverter. List four applications of Inverters.
- (g) Draw & explain the class C commutation with neat circuit diagram & waveforms.
- (h) Define commutation. List various types of commutation.
- (i) Explain Complementary Commutation with necessary diagrams & waveforms.
- (J) With necessary waveforms explain the turn-off mechanism of SCR.
- (K) Explain resonant commutation with necessary waveforms.

Unit-IV

1. Attempt the following.

Marks-2 or 3

- a) What is dual converter ? List the different modes of dual converter.
- b) Draw an Ideal dual converter.

2. Attempt any Three / Four

Marks-4

- a) Compare controlled and uncontrolled rectifier (any four points).
- (b) Draw and explain single phase half wave controlled rectifier circuit with RL load.
- (e) Describe the effect of free wheeling diode in controlled rectifiers.
- (f) Draw the single phase full wave bridge type controlled rectifier. Draw the waveforms of input voltage, load voltage and voltage across SCR.
- (g) Differentiate between single phase controlled half wave rectifier and single phase controlled full wave rectifier.
- (h) A single phase half wave rectifier is used to supply power to load impedance 10Ω from 230 V, 50 Hz A.C. supply at firing angle 30° . Calculate average load voltage.
- (i) Draw single phase centre tapped controlled rectifier with RL load and draw its load voltage waveforms.
- j) Draw 1ϕ HWCR with inductive load. Draw input and output waveforms. Describe its operation.
- (k) State the use of free wheeling diode in controlled rectifiers.
- (l) Compare controlled and uncontrolled rectifiers. (any four points)
- (m) Define firing angle and conduction angle. What is the effect of firing angle on average output voltage ?

(n) Draw and explain single phase half wave controlled rectifier with R load. State the equations of average voltage and current.

(o) A single phase half wave controlled rectifier is supplied with a voltage $v = 110 \sin (.628 t)$. Find the average DC output voltage and current, if the firing angle is 15° and $R_L = 200 \Omega$.

(p) Draw the ckt diagram of Non circulating current type dual converter & writes its working.

(q) Draw the ckt diagram of Circulating current mode type dual converter & writes its working.

® For step down chopper show that.....

$$V_o = f * T_{on} * V_s.$$

Where, $V_o =$ O/p Voltage

$V_s =$ i/p voltage

$f = 1/T,$

$T = T_{on} + T_{off} =$ Chopping period.

(s) For the step-up Chopper show that.....

$$V_o = V_s / (1 - \alpha)$$

Where, $V_o =$ O/p Voltage

$V_s =$ i/p voltage

$T = T_{on} + T_{off} =$ Chopping period.

$\alpha = T_{on} / T$

Unit-V

1. Attempt the following.

Marks-2 or 3

- a) List three applications of chopper.
- b) State the concept of chopper.
- c) List three applications of Inverter.
- d) State the classification of Chopper.
- (e) Give the classification of chopper. Define inverter.
- (f) Define any three performance parameters of inverter.

2. Attempt any Three /Four :

Marks-4

- a) Define inverter and give classification of inverter.
- b) Draw the circuit diagram of step-up chopper and state its operating principle.
- c) State different performance parameters of inverter and describe any two in details.
- d) Compare between step up and step down chopper. (any 4 points)
- e) Draw circuit of step down chopper and explain its working with neat waveforms.
- f) Draw and explain the circuit diagram of series inverter with waveforms.
- (g) Draw and explain step-down chopper with relevant waveforms.
- (h) Give a detailed classification of inverters.
- (i) Draw a neat circuit diagram of single phase half bridge inverter. Explain with waveforms.
- (j) Explain the principle of step up chopper with a neat diagram.

Unit-VI

1. Attempt the following.

Marks-2 or 3

- (a) Draw the circuit of light dimmer using DIAC and TRIAC
- (b) Draw circuit diagram of low power Automobile/ DC flasher.
- © Draw the circuit diagram of DC Time Delay Relay using SCR

2. Attempt any Three /Four:

Marks-4

- a) Draw the labelled circuit diagram of DC Time Delay Relay using SCR & write its working.
- b) Sketch circuit diagram of low power Automobile/ DC flasher and state how flashing occurs.
- (c) Draw the neat circuit diagram of fan speed regulator using Triac. Describe its working.
- (d) Draw the circuit diagram of light dimmer using DIAC and TRIAC and sketch the input and output voltage waveforms.
- (e) Describe the working of flasher circuit using SCR with neat diagram.

****Note:** All the students should note that above questions are for your convenience & reference only. For examination purpose you have to prepare extra questions more