15110

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – B.Tech.(EE)-2023
Course Name – Power Electronics
Course Code - PCC-EE504
(Semester V)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Observe the period of freewheeling, for a single-phase half-wave circuit with RL load and a freewheeling diode

a) 0 to π b) $\pi/2$ to $2\pi-\alpha$
c) α to $\pi+\alpha$ d) π to $2\pi+\alpha$

(ii) Tell the six SCR's are fired at intervals of _______ for a three-phase full converter.

a) 30° b) 60°
c) 90° d) 120°

(iii) Observe the two transistor model of the SCR can be

a) bisecting the SCR vertically b) bisecting the SCR horizontally
c) bisecting the SCRs top two & bottom two layers d) bisecting the SCRs middle two layers

(iv) Judge when SCR is OFF, the current in the circuit is

a) Exactly zero b) Small leakage current
c) Large leakage current d) none of these

(v) Select use of a step-down chopper is

a) electric traction b) electric vehicles
c) machine tools d) all of these

(vi) Focus if a single-phase half-wave circuit with RL load, with firing angle α and extinction angle β, the thyristor is reversed biased from

a) β to α b) β to $(2\pi+\alpha)$
c) β to 2π d) β to 2β

(vii) Predict the ratio of holding current to latching current is _____ in a thyristor.

a) 0.4 b) 1
c) 2.5 d) 4

(viii) Identify the condition if a step-up chopper's switch is always kept off then (ideally)

a) V0 = 0 b) V0=1

c) V0 = VS | d) V0 > VS

(ix) Tell once SCR starts conducting a forward current, its gate loses control over

a) anode circuit voltage only | b) anode circuit current only
c) anode circuit voltage and current | d) anode circuit voltage, current and time

(x) Indicate the magnitude of the anode current of a thyristor will

a) increase if gate current is increased | b) decrease if gate current is decrease
c) increase if gate current is decrease | d) not change with any variation in gate current

(xi) Select the maximum conduction of each thyristor is _____ in a three-phase bridge rectifier.

a) 120 deg. | b) 90 deg.
c) 30 deg. | d) 60 deg.

(xii) Write the conduction angles of a single-phase full wave controlled bridge rectifier appear with minimum output voltage and maximum output voltage.

a) 0°, 180° respectively | b) 180°, 0° respectively
c) 0°, 0° respectively | d) 180°, 180° respectively

(xiii) Predict the waveshapes of output voltage and output current of a fully controlled bridge converter feeding a resistive load

a) are always similar | b) can never be similar
c) may be similar or dissimilar | d) are similar only if firing angle is zero

(xiv) Tell a fully controlled converter uses

a) diodes only | b) thyristors only
c) both diodes and thyristors | d) none of these

(xv) Select the correct option the advantage of using a freewheeling diode in half controlled bridge converter is that

a) there is always a path for the DC current independent of the AC line
b) there is always a path for the AC current dependent of the AC line
c) there is always a path for the DC current dependent on the AC line
d) there is always a path for the AC current independent of the AC line

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain about dv/dt triggering of SCR. (3)
3. Explain the need of using freewheeling diode. (3)
4. Discuss the advantages of Single-Phase Bridge Converter Over Single-Phase Mid-Point Converter. (3)
5. Describe the blocking mode of operation of SCR. (3)
6. Express the ratio of output to input voltage of step down chopper. (3)

OR

A step up chopper has an input voltage of 150V. The voltage output needed is 450V. Given, that the thyristor has a conducting time of 150μseconds. Calculate the chopping frequency. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Explain briefly two transistor analogy of SCR. (5)

8. Discuss about Time Ratio Control strategy of a chopper. (5)
9. Explain the effect of source inductance on single phase converter. (5)

10. Calculate the time ratio of the chopper circuit which is connected to a 100 V DC source that supplies an R-L load. the load inductance is 40 mH and the resistance is 5 ohm. A freewheeling diode connected across the load. The load current varies between the limits of 10 A and 12 A. (5)
11. Express the 180° mode of conduction of a three phase inverter. (5)
12. Evaluate the conduction and blocking period of thyristor in each cycle when a chopper circuit is operating on TRC principle at a frequency of 1 kHz on a 220 V DC supply. and the load voltage is 180 V. (5)

OR

Evaluate the time ratio of the chopper when its connected to a 80 V DC source supplies to an R-L load. The load inductance is 40 mH and resistance is 6 ohm. The load has a freewheeling diode across it. It is required to vary the current between the limits of 10 A and 12 A. (5)

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