PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B. Tech. Winter 2022 - 23 Examination

Semester :7   Date: 11/10/2022
Subject Code: 03107432   Time: 10:30am to 1:00pm
Subject Name: Power Electronics   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five   **(15)**

in case of MCQ) (All are compulsory) (Each of one mark)

1. SCR is considered to be semi controlled device because

    a.   it can be turned OFF but not ON with a gate pulse.

    b.   it conducts only during one half cycle of an alternating current wave.

    c.   it can be turned ON but not OFF with a gate pulse.

    d.   it can be turned ON only during one half cycle of an AC.

2. Let of a thyristor V_{c1}, V_{c2}, V_{c3} are forward break over voltage for gate current I_{g1}, I_{g2}, I_{g3} respectively. Then

    a. $V_{c1} > V_{c2} > V_{c3}$ when $I_{g1} > I_{g2} > I_{g3}$.

    b. $V_{c1} > V_{c2} > V_{c3}$ when $I_{g1} < I_{g2} < I_{g3}$.

    c. $V_{c1} = V_{c2} = V_{c3}$ any value of I_g.

    d. $V_{c1} > V_{c2} > V_{c3}$ when $I_{g1=} I_{g2}$

3. Why is it necessary to reduce harmonics from output of Inverter ?

4. What is snubber circuit ?

5. State any two difference between VSI and CSI.

6. Define commutation of SCR . In which case force commutation is needed ?

7. State Advantages of Free wheeling Diode.

8. What is SOA in BJT ?

9. How many device conducts during commutation overlap in case of single phase full converter ?

10. In which quadrant Single phase half controlled converter can operate?

11. In single phase full converter, if firing angle is α, then find supply power factor.

12. Two quadrant Type A or Type C chopper operates in which quadrant ?

13. Define modulation index of Inverter. What is range of Modulation Index ?

14. What is limitation of Resistance firing method for triggering of SCR ?

15. State output voltage expression for single phase semi converter .

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Explain Voltage Commutated Chopper with necessary waveforms.

B) For Single phase Semi converter with R L E load, derive an expression for output voltage, load current. Draw necessary waveforms for continuous and discontinuous conduction.

C) A highly inductive load requires 12 A at 150 V. The voltage drop across a conducting thyristor is 1.5 V and $\alpha = 30^0$. Find input transformer secondary voltage for (a) Full wave converter with center tapped transformer (b) Fully controlled bridge converter.

D) Followings are the specifications of a Thyristor operating from a peak supply of 400 V. Repetitive peak current $I_{PK} = 200$ A. $(dI/dt)_{MAX} = 15$ A/μS $(dV/dt)_{MAX} = 100$ V/μS. Choosing a factor of safety of 2 for I_{PK}, $(dI/dt)_{MAX}$, $(dV/dt)_{MAX}$ design a suitable snubber circuit for load resistance of 10 ohm.

Q.3 A) Draw and explain with load current and load voltage wave form for single phase full bridge VSI with R, and RL load. **(07)**

B) Derive an Expression for I_{MAX} and I_{MIN} current under steady state condition for Type A Chopper for continuous conduction. From that find ripple current and for what value of duty cycle is ripple maximum? **(08)**

OR

B) Compare Linear regulator with Switching regulator. Explain boost converter for continuous conduction mode. **(08)**

Q.4 A) State various methods of speed control of induction motor. Explain any one in detail. **(07)**

OR

A) State Methods of Electric breaking for DC motor. Explain any one in detail. **(07)**

B) Explain Three phase half bridge inverter with 120 degree mode of conduction. Compare performance with 180 degree mode of conduction. **(08)**