(b) Discuss the operation of single phase AC voltage controller feeding R. L. Load. Draw the wave forms for output voltage, voltage across SCR's, source current. 10

Or

10. (a) Describe the operating principle of cyclo-converter. Give its classification and applications. 10

(b) Describe the two types of ac voltage controllers. Which one of these is preferred and why ? 10

Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No. .....

EX–504(N)

B. E. (Fifth Semester) EXAMINATION, Dec., 2009

(New Scheme)

(Electrical & Electronics Engg. Branch)

POWER ELECTRONICS DEVICES AND CIRCUITS

[EX–504(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *five* questions, selecting *one* from each Unit.

Unit–I

1. (a) What is complementry impulse commutation ? Describe this type of commutation with a circuit-diagram and appropriate wave form. 10

(b) Discuss the two transistor model of a thyristor. Using this model explain the gate turn on mechanism. 10

Or

2. (a) Explain the different turn on methods of thyristor. 10

(b) Explain the thyristor protection. In Snubber circuit a resistor is used in series with the capacitor. Why ?

Unit – II

3. (a) Describe the working of a single phase full converter in the rectifier mode with RLE load through the wave form of source voltage. E output voltage and current, source current. Assume continuous conduction. Derive an expression for average and rms output voltage. From the voltage differential equation of this converter show that $V_0 = I_0R + E$. 10

   (b) For a 3ϕ full converter, sketch the time variations of input-voltage and output voltage across the RL load for a firing angle delay of (i) 30° (ii) 120°. 10

Or

4. (a) A single phase full converter bridge is connected to RLE load. The source voltage is 230 V, 50 Hz. The average load current of 10 A is continuous over the working range. For R = 0·4 Ω and L = 2 m H, compute : 10

   Firing angle delay for E = 120 V and sketch the time variation of output voltage and load current

   (b) Show that the performance of a single-phase full converter as affected by source inductance is given by the relation

$$\cos(\alpha + \mu) = \cos\alpha - \frac{W L_s I_0}{V_m}. \qquad 10$$

Unit – III

5. Discuss the principle of working of a three phase bridge inverter with an appropriate circuit diagram. Draw phase and line voltage wave forms on the assumption that each

thyristor conducts for 120° and resistive load is star connected. The sequence of firing of various SCR should also be indicated in the diagram. 20

Or

6. (a) Describe modified MC-Murray half bridge inverter with appropriate voltage and current wave form. 10

   (b) What is pulse width modulation ? List the various PWM techniques. How do these differ from each other ? 10

Unit – IV

7. (a) Describe the principle of step-up chopper. Derive an expression for the average output-voltage in terms of input DC voltage and duty cycle. 10

   (b) Describe the voltage commutated chopper with relevant-current and voltage wave forms as a function of time. 10

Or

8. (a) What is a dc chopper ? Explain the four quadrant chopper or type E chapper. 10

   (b) A step up chapper has input voltage of 220 V and output-voltage of 660 V. If the non-conducting time of thyristor chopper is 100 μ s, compute the pulse width of output voltage. 10

   In case pulse width is halved for constant frequency operation, find the new output voltage.

Unit – V

9. (a) Explain the operation of a single phase to single phase cycloconverter feeding resistive load.