Q.P. CODE: 36008

(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Answer any **three** from the remaining **five** questions.
(3) **Assume** suitable **data** if necessary and justify the same.
(4) **Figures** to the **right** indicate the marks.

1. (a) Explain the operation of DIAC along with structured diagram and characteristics. **[5]**
   (b) Explain the multiple PWM technique to control the output voltage of an inverter. **[5]**
   (c) Explain the operation of Buck converter and derive the expression for duty cycle. **[5]**
   (d) Derive the expression of average voltage for single phase half wave controlled rectifier with RL load with circuit diagram and waveform. **[5]**

2. (a) State the limitations of R-firing circuit and explain the working of RC half wave triggering circuit. **[10]**
   (b) Compare the performance of MOSFET and IGBT. **[5]**
   (c) Discuss the need for snubber circuit in SCR. **[5]**

3. (a) Discuss the operation of single phase full wave rectifier (bridge configuration) for RL load. Derive the expression of average output voltage and draw the necessary waveform for output voltage and current, thyristor voltage, gate pulse and input voltage. **[10]**
   (b) Explain the working of three phase full converter with R load. Draw the corresponding input voltage and output voltage waveform for $\alpha = 60°$ **[10]**

4. (a) Explain the effect of freewheeling diode in single phase half wave rectifier with RL load. **[5]**
   (b) Explain the dynamic turn ON characteristics of SCR. **[5]**
   (c) Explain the sinusoidal PWM technique used in inverter. State the advantage of PWM technique. **[10]**

5. (a) Discuss the operation of three phase bridge inverter with 120° conduction mode. Draw the waveform for phase voltage and justify it. **[10]**
   (b) A boost converter has an input voltage of 10V. The average output voltage is 18V and average load current is 1A. The switching frequency is 20kHz. If L = 150µH and C = 220µF. Calculate (i) Duty cycle, (ii) inductor current ripple, (iii) the minimum and maximum value of inductor current, (iv) output voltage ripple and (v) the value of filter inductance and capacitance at boundary conditions. **[10]**

6. (a) Explain the operation of step down cycloconverter with neat circuit diagram. **[5]**
   (b) Give comparison between VSI and CSI. **[5]**
   (c) Explain the operation of single phase bidirectional phase control AC voltage controller connected to RL load. **[10]**
