Code No: G4302/R13

ANALYSIS OF POWER ELECTRONIC CONVERTERS (PE)

(Common to PE, P&ID, PE&ED, PE&D, EM&D and PE&PS)

Time: 3 hours   **Max. Marks: 60**

Answer any FIVE Questions
All Questions Carry Equal Marks

1. a   Draw the load current waveforms PWM control based 1ϕ phase ac voltage controller with R and R-L loads, Briefly describe its operation?   6 M

    b   A three phase ac voltage controller feeds a balanced star connected R-L load. The value of resistance is 10 Ω and inductance is 6.5mH. The controller is fed from a 3-phase supply of 400V, 50Hz. Determine for a firing angle of 30^0, the values of i) rms load current ii) rms load voltage iii) Power factor.   6 M

2.   Describe the operation of fully controlled 3ϕ phase ac voltage controller used for star connected load of non-isolated neutral, for the firing angle of

    (a) $60^0 \leq \alpha \leq 90^0$ 6 M

    (b) $90^0 \leq \alpha \leq 150^0$ 6 M

3. a   A single phase semi converter 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 = 0.5 Ω and L = 2 mH, compute firing angle delay for E = 120 V.   6 M

    b   Describe the operation of sinusoidal PWM control based 1ϕ full converter?   6 M

4. a   A three-phase, half wave converter is operated from a 3-phase, Y-connected 440 V, 50 Hz supply and the load resistance is R = 20 Ω. If it is required to obtain an average output voltage of 50% of the maximum possible output voltage, calculate: 6 M
      i.   Firing angle,
     ii.   Rectification efficiency and
    iii.   Input power factor.

    b   Deduce the harmonic performance factors of series 1ϕ semi converter?   6 M

5.   Deduce the steady state analysis of single stage boost power factor corrected 1ϕ rectifier?   12 M

6.   Explain single phase bridge inverter control by   12 M
    a)   60 Degree PWM
    b)   Third Harmonic injection PWM?

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7. Describe the 1ϕ phase flying capacitors multilevel inverter operation? Compare its features with 1ϕ phase diode-clamped multilevel inverter?   12 M

8. Describe the operation of
    (a) Current source inverter   12 M
    (b) Three phase boost PFC

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