B.E.(with Credits)-Regular-Semester 2012-Electrical Engineering (E. & P.) Sem VII
EP - Power Electronics

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Notes : 1. All questions carry equal marks.
2. Illustrate your answers wherever necessary with the help of neat sketches.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Use of non-programmable calculator is permitted.

1. a) Draw the gate characteristics of SCR & explain it in detail. **8**

 b) What do you mean by commutation of SCR? What are the different classes of forced commutation method? Explain class-C with its associated waveform. **8**

OR

2. a) With the help of neat diagram, explain the two transistor analogy of SCR. Derive equation. **8**

 b) Explain how UJT can be used in obtaining Relaxation oscillator for triggering of SCR. **8**

3. a) A 3-ϕ, fully controlled bridge converter is connected to three phase ac supply of 400V, 50 Hz and operates with a firing angle $\alpha = \pi/4$. The load current is maintained constant at 10A and the load voltage is 360V. Compute **8**
    1) Source inductance.
    2) Load Resistance R
    3) Overlap angle μ.

 b) Explain the effect of source inductance on the performance of a 3-ϕ, fully controlled bridge circuit. **8**

OR

4. a) Explain the 1-ϕ, fully controlled mid-point rectifier with R-L load. And derive average output voltage and average output current for it. **8**

 b) A 1-ϕ, fully controlled bridge circuit is used for obtaining a regulated dc output voltage. The RMS value of the ac input voltage is 230V, and the firing angle is maintained at $\pi/3$ and load current is 4A. Calculate **8**

    1) dc output voltage.

    2) Active and Reactive power.

5. a) Draw a diagram of parallel inverter employing feedback diodes. Explain the working of inverter with their associate waveform. And give the design aspect parallel inverter. **10**

   b) Compare between voltage source inverter and current source inverter. **6**

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6. a) The 1-ϕ, half bridge inverter has a resistive load R = 3Ω and the dc input voltage E_{dc}=50V. calculate **8**
   1) RMS O/P voltage at a fundamental frequency E_1.
   2) The output power, P_0.
   3) The average & peak current of each thyristor.
   4) The peak reverse blocking voltage of each thyristor.

   b) With the help of neat circuit diagram and its waveform, explain briefly the operation of transistorised 3-ϕ bridge inverter with resistive load in 120° conduction mode. **8**

7. a) Draw the schematics of step-up chopper and derive an expression for output voltage in terms of duty cycle for a step-up chopper. **8**

   b) Explain the operation of 1-ϕ, bridge type cycloconverter with RL Load in continuous current conduction mode. **8**

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8. a) Explain the operation of oscillating chopper with its relevant waveform. **8**

   b) Describe a Morgan chopper with associated voltage and current waveform for it. **8**

9. a) Explain in detail snubber circuit. Also give its design consideration. **8**

   b) Calculate the number of SCR each with rating 500V, 75A required in each branch of series and parallel combination for a circuit with the total voltage and current rating of 7.5 KV and 1000 A. Assume Derating factor of 14%. **8**

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10. a) Derive an expression for STATIC EQUALISING CIRCUIT parameter for in number of series connected SCR's. **8**

   b) Explain how SCR can protected from over current and over voltage protection of SCR. And give its significance for each. **8**

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