M.E. First Semester (Electrical & Elect. Engg.) (New-CGS)
13282 : Advanced Power Electronics : 1 EEEME 2

P. Pages : 2

Time :

0390

Max. Marks : 80

Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answer necessary with the help of neat sketches.
5. Use of slide rule logarithmic tables, Steam tables, Mollier's Chart, Drawing instrument, Thermodynamic table for moist air, Psychrometric Charts and Refrigeration charts is permitted.

SECTION - A

1. a) What is holding current and latching current in SCR? Explain the gate characteristics of an SCR. What are different signals used for turning on SCR by gate control? Compare them. **10**

   b) What are the problem of series/parallel IGBT. **4**

OR

2. a) Derive expression for turn off gain of GTO. Also discuss on the magnitude of negative gate current for reliable turn off of GTO. **7**

   b) Compare BJT, MOSFET and IGBT with respect to base/gate control variable, control characteristics, switching frequency. Max voltage/current rating, advantages and limitation. **7**

3. Draw and explain the waveform of circuit variable associated with cuk and sepic converters. Compare advantages and limitation of cuk and sepic converter with respect to those basic converter. **13**

OR

4. With the help of diagram and waveform, discuss the operation of Buck-Boost converter. Also derive the expression for peak to peak ripple current and ripple voltage in case of buck-boost converter. **13**

5. a) Design 60Hz power transformer of the specification : **7**
   Primary voltage $V_i = 120V$, 60Hz (Square wave), secondary voltage output $V_o = 40V$, secondary output current $I_o = 6.5A$.
   Assume transformer efficiency $\eta = 95\%$ window factor $K_U = 0.4$ USE E – core.

   b) Explain single pass transformer design procedure by using its flowchart. **6**

OR

6. a) Design a dc inductor in $L = 450\mu H$. The dc current is $I_L = 2.7A$ with ripple of $\Delta = 1A$. assume window factor $K_U = .04$. Use power core with graded of air gap. **7**

b) Explain the terms : -   6
   a) Hysteresis loss.   b) Eddy current loos.
   c) Skin effect for design the magnetic component.

SECTION - B

7. a) Explain the principle working of 3-phase bridge inverter with 120° mode of operation with   7
      diagram and waveform.

   b) Explain harmonic reduction methods   7
      1) Phase displacement.
      2) Bipolar output voltage notches with diagram.

OR

8. a) Explain the pulse width modulation techniques for control of AC output voltage.   7

   b) What are performance difference between voltage source and current source inverters.   7

9. a) What is switching model of MOSFET.   7

   b) What is need of electrically isolated drive circuits.   6

OR

10. a) Explain different gate drive techniques with base circuit and key features.   7

    b) Explain with diagram the methods of control signal isolation.   6

11. a) Why the power factor of semi-converter is better than of full converter.   7

    b) Explain the series switching control of AC loads.   6

OR

12. a) Explain with diagram and waveform the two types of control used for power transfer.   7

    b) Explain the principle of   6
       1) ON-OFF control.
       2) Phase control of AC voltage controller with diagram.

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