Hall Ticket No | | | | | | | | | | | Question Paper Code: AEE010

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations (Regular) - November, 2018

Regulation: IARE – R16

POWER ELECTRONICS

Time: 3 Hours **(EEE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Distinguish between the power MOSFET and BJT. **[7M]**

   (b) The trigger circuit of a thyristor has a source voltage of 15V and line has a slope of -120V per ampere. The minimum gate current to turn-on the SCR is 25mA. Compute the **[7M]**

   i. Source resistance required in the gate circuit

   ii. The trigger voltage and trigger current for an average gate power dissipation of 0.4Watts.

2. (a) Explain the various types of commutation circuits for SCR. **[7M]**

   (b) For an SCR, gate-cathode characteristics is given by V_g=1+10I_g. Gate source voltage is a rectangular pulse of 15V with 20µ sec duration. For an average gate power dissipation of 0.3W and a peak gate drive power of 5W, compute **[7M]**

   i. The resistance to be connected in series with the SCR gate,

   ii. The duty cycle of the triggering pulse.

UNIT – II

3. (a) Explain the working of a single phase fully - controlled bridge converter in the inversion mode. **[7M]**

   (b) With suitable circuit topology, voltage and current waveforms, reflect the effect of input source impedance on the average output of a single phase fully controlled converter. **[7M]**

4. (a) Discuss the various performance factors of line commutated converters. **[7M]**

   (b) A single phase fully controlled bridge converter supplies an inductive load. Assume that the output - current is virtually constant, and is equal to Id, determine the following performance parameters. The supply voltage is 230V and firing angle is maintained at (π/6) radians. **[7M]**

   i. Average output voltage

   ii. Supply RMS

   iii. fundamental power factor.

   iv. Voltage ripple factor.

UNIT – III

5. (a) Describe the operation of single phase full wave AC voltage controller with the help of voltage and current waveforms. **[7M]**

   (b) A single phase voltage controller is employed for controlling the power flow from 230V, 50 Hz source into a load circuit consisting of R=3Ω and ωL=4Ω, Calculate **[7M]**

   i. The control range of firing angle

   ii. The Maximum value of rms load current

6. (a) Explain the principle of operation and working of single phase to single phase step-up cycloconverter. **[7M]**

   (b) Explain the advantages and disadvantages of Cycloconverter and AC Voltage controller. **[7M]**

UNIT – IV

7. (a) Explain the current limit control method of the output voltage control of choppers. A step - up chopper is used to deliver load voltage of 500 V from a 220 V DC source. If the blocking period of the thyristor is 80 μs. Compute the required pulse width. **[7M]**

   (b) Explain the working of a Cuk converter with a neat circuit diagram and associated voltage and current waveforms. **[7M]**

8. (a) Describe the working principle of buck-boost converter with necessary circuit and waveforms. **[7M]**

   (b) For type A chopper feeding RLE load, obtain maximum value of average current rating for the thyristor in case load current remains constant. **[7M]**

UNIT – V

9. (a) Discuss the functioning of three phase voltage source inverter in 120 degree operating mode with relevant waveforms and obtain the expression for voltage. **[7M]**

   (b) A single phase full bridge inverter is fed from a DC source such that fundamental component of output voltage is 230V. Find the RMS value of thyristor and diode current for R=2 Ω load. **[7M]**

10. (a) Compare the Voltage Source and Current Source Inverters. **[7M]**

    (b) Explain the working of a basic parallel inverter with neat circuit and related circuit voltage and current waveforms. **[7M]**

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