Subject- Power Electronics

A.Y. 2021-22 Sem: VI

Course: T.E. (Electrical) Subject Code: BTEEC603

Unit-1

Q.1 Enlist the various power semiconductor devices with their ratings, application and symbols.

Q.2 Plot the switching characteristics of Thyristor, BJT and MOSFET

Q.3 What do you understand by 'Latching Current' and 'Holding Current' in thyristor?

Q.4 Explain the reverse recovery process in Thyristor and describe the condition for ideal commutation in thyristors.

Q.5 Differentiate between Power BJT, Power MOSFET and SCR.

Unit-2

Q.1 What are the different firing schemes in Thyristors? Explain the Thyristor firing using UJT

Q.2 Explain and plot the static and switching characteristic of SCR.

Q.3 Explain the process of SCR firing using UJT.

Q.4 What are different commutation schemes in thyristor. Explain any one of them in detail.

Q.5 Write short notes on following: **(CO1, CO2)**

a. Pulse transformer

b. Optocoupler

c. IGBT

Unit-3

1 Explain the working of single-phase full wave semi controlled bridge rectifier feeding an R-L Load with continuous conduction in output current. Derive the expression for average and rms value of output voltage and current.

2 Derive the expression for output voltage and current of a single-phase controlled rectifier feeding an R-L-E load. Plot the waveforms of input and output voltage.

3 Discuss about the effect of source inductance in a line commutated convertor.

4 A single phase half wave rectifier feeding a resistive load with firing angle 90 (degree). Determine:

(a) Rectification Efficiency

(b) form factor

(c) Ripple factor

(d) Transformer utilization factor

5 A single phase full convertor feeding an R-L load having L= 6.5 mH, R= 0.5 Ohm, Vs= 120V, and load power factor angle = 78.47(degree). Determine

(a) Load current at wt= 60 (degree)
(b) Average thyristor current Ia
(c) RMS thyristor current
(d) RMS output current
(e) Average output current

6 A three-phase half wave convertor operated from a three phase star connected 208V, 60Hz supply and the load resistance is 10 Ohm. If it is required to obtain an average output voltage of 50 % of the maximum possible output voltage, calculate,
(a) delay angle alpha
(b) RMS and average output currents
(c) Average and rms thyristor currents
(d) Rectification efficiency
(e) TUF
(f) Input power factor

Unit-4

Q.1 Explain the following principles of voltage control in detail.
(i) On-off control, (ii) Phase control

Q.2 How Triac is helpful to control the AC voltage. Explain full wave AC controller in detail.

Q.3 What are different schemes for step up or step down the supply frequency in AC supply system.

Q.4 Explain the working of single-phase stepdown cycloconverter.

Unit-5

Q.1 Explain the working of buck converter feeding an R-L-E load.

Q.2 Derive the expression for output voltage of Buck-Boost converter.

Q.3 A Step-up chopper has input voltage of 220V and output voltage of 660V. if the conducting time of thyristor chopper is 100micro sec. compute the pulse width of output voltage. In case output voltage pulse width is half for constant frequency operation, find the average value of new output voltage.

Q.4 A buck-boost converter has input voltage 220V and output voltage 660V. if conduction time of chopper is 120 micro sec. compute the pulse width of lad voltage. In case pulse width of load voltage increased to three times its previous width. For constant frequency operation. Calculate the new value of average output voltage.

Unit-6

Q.1 Differentiate between voltage source inverter and current source inverter.

Q.2 Explain in detail the working of single-phase full bridge current source inverter feeding an R-L Load.

Q.3 How RLC overdamped and underdamped load affect the performance of Voltage source inverter.

Q.4 How a DC supply can be used to feed a three-phase balanced load. Draw the suitable circuit diagram and explain its working.