PX 5152 Analysis and Design of Power Converters

Important 13 Marks Questions

Unit I

1. Describe the working of phase fully controlled bridge converter in the inversion mode with RL load with neat sketch and waveform.
2. A 3-phase converter is used for obtaining a regulated DC output voltage. The supply voltage is 650 V and the firing angle is maintained at 30 degrees so that the load current is 20 A. Calculate:
   (i) DC output voltage
   (ii) Active and reactive power input
   (iii) DC output voltage if freewheeling diode is connected
   (iv) Derive the expression.
3. Explain with the help of waveforms the operation of a single-phase half bridge inverter.
4. Discuss the different techniques adopted to eliminate harmonics generated by inverter circuits.
5. Describe modified McMurray full bridge inverters with appropriate voltage and current waveforms. Derive the expressions for the commutating components L and C.

Unit II

1. Discuss the effect of source inductance on the performance of a three-phase half-controlled bridge converter.
2. Explain the continuous and discontinuous mode of operation of 3 phase semiconverter connected to RL Load.
3. With necessary diagram describe the space vector modulation used to control the output voltage of three phase inverter.
4. With necessary diagram describe the sinusoidal pulse used to control the output voltage of three phase inverter.
5. Types of space vector modulation and different output waveforms.

Unit III

1. Explain the working of resonant converter with neat diagram and waveform.
2. Describe the working of SEPIC converter with neat diagram.
3. Design and describe the analysis of buck-boost converter.
4. Explain the working principle of two quadrant operation of DC-DC converter with relevant waveforms.
5. Describe elaborately the single phase auto sequential commutated CSI with relevant mode diagrams and waveforms.

Unit IV

1. A 3-phase voltage controller feeds an RL load the value of $R = 9\Omega$ and$L = 9.3\,mH,$ the controller is supplied with 650 V, 50Hz supply for $\propto = 990$ degrees. Determine:
   (i) Conduction angle
   (ii) Average output voltage
   (iii) RMS output voltage
   (iv) Power factor also
   (v) Derive the expression for instantaneous current.
2. Explain the working of star connected 3 phase AC voltage controller with RL load with neat diagrams and waveforms for $\propto = 30$ degrees.
3. Explain the working of delta connected three phase AC voltage controller with suitable power diagram. Also draw the relevant waveforms for $\propto = 120^0$.
4. A single-phase AC voltage controller feeds an RL load, the resistance value is 2.5Ω and L=5 mH, the controller is supplied from a 220 V, 50 Hz supply for $\propto = 60^0$
   (i) Conduction angle
   (ii) Average output voltage
   (iii) RMS output voltage
   (iv) Power factor
   Also drive the expression for the instantaneous load current.
5. Explain the operation of flying capacitor multilevel inverter with necessary wave forms. Discuss its advantages and disadvantages.

Unit V

1. Explain the working of single phase cycloconverter and mention its circuit arrangement and also mention its applications.
2. Explain the working principle and operation of single phase to single phase discontinuous mode operation of cycloconverter.
3. State the methods for voltage control of series resonant inverters? Explain any two methods in detail.
4. Derive three-phase to three-phase cycloconverter with relevant circuit arrangement using 18 thyristors.
5. Describe the basic principle of operation of a single phase to single phase cycloconverter for both continuous and discontinuous conduction modes.