Q. Code: 664131

Reg. No. | | | | | | | | | |

M.E. / M.TECH. DEGREE EXAMINATIONS, MAY 2019

Second Semester

PD18201 – ANALYSIS AND DESIGN OF INVERTERS

(Power Electronics and Drives)

(Regulation 2018)

Time: Three Hours **Maximum : 100 Marks**

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

1. Distinguish harmonic factor from distortion factor.
2. What is over-modulation?
3. What are the considerations in choosing the motor size for a particular drive application?
4. What advantage does 120° mode inverter have over 180° mode inverter?
5. Specify the different operating modes of a current source inverter.
6. Sketch the schematic of a 4 quadrant 6-step thyristor inverter.
7. When is a multi-level inverter preferred over a 2 level inverter?
8. Draw the schematic of a single phase, 3 level diode-clamped inverter.
9. What are the disturbances that occur on power lines?
10. Distinguish between online and offline UPS.

PART B - (5 X16 = 80 Marks)

11. (a) (i) Elucidate the principle of operation of a single phase half-bridge inverter with neat diagrams and waveforms. Identify the devices that are in conduction at any time and obtain expressions for total and fundamental rms output voltage. **(8)**

(ii) A single phase full bridge inverter has a resistive load of R = 2.4 Ω and the dc input voltage is 24V. Determine (a) the rms voltage at the fundamental frequency, (b) Output power, (c) Average current through a transistor, (d) Total harmonic distortion. **(8)**

(OR)

(b) (i) Discuss the different techniques for eliminating specific harmonics from the output of an inverter. **(8)**

(ii) A single-phase bridge inverter, fed from 230 V dc, is connected to a load with R = 10 Ω and L =0.03 H. Determine the power delivered to load in case the inverter is operating at 50 Hz with a quasi-square wave output, having an ON period of 50%. **(8)**

12. (a) (i) A 180 degree mode inverter is connected to a 3 phase delta connected motor load. Obtain the total and fundamental rms components of motor phase voltages. **(8)**

(ii) How can the output voltage of a three phase inverter be controlled by sinusoidal pulse width modulation? **(8)**

(OR)

(b) (i) Explain the principle of space vector modulation. **(10)**

(ii) Discuss the application of drives for a steel mill. **(6)**

13. (a) A three phase auto-sequentially commutated inverter is connected to a motor load. Explain the operating modes and derive an expression for thyristor turn-off time. What is the maximum operating frequency without overlap? **(16)**

(OR)

(b) (i) Compare current source and voltage source inverters. **(8)**

(ii) Describe the trapezoidal PWM technique for Current source inverters. **(8)**

14. (a) (i) Describe a multicarrier PWM scheme for a multilevel inverter with level shifted modulation. **(8)**

(ii) Outline the operation of a single phase voltage fed Z-source inverter with a neat diagram. **(8)**

(OR)

(b) Sketch the schematic of a three phase, 5 level, cascaded multi-level inverter and identify the switching states for equal dc voltages. Comment on the voltage stresses across the switches. **(16)**

15. (a) (i) Explain with a neat schematic and waveforms, the operating modes of a single phase full bridge series resonant inverter. **(10)**

(ii) Derive an expression for the gain of a parallel loaded series resonant inverter by fundamental approximation method and sketch the frequency response for loads with different quality factors. **(6)**

(OR)

(b) Explain the operation of a Class-E resonant converter with a neat schematic and waveforms. **(16)**