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

Question Paper Code : 31288

M.E./M.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

Power Electronics and Drives

PX 4151– ANALYSIS OF POWER CONVERTERS

(Common to: M.E. Power Systems Engineering)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A – (10 × 2 = 20 marks)

1. Draw the static characteristics of SCR.
2. What is Sequence control of converters?
3. List the advantages of 12 pulse converter.
4. State the important parts of DC drive system.
5. What are self commutated switches? Why?
6. Define Modulation index.
7. Compare SPWM and SVPWM.
8. Discuss the merits and demerits of 180° and 120° conduction scheme.
9. What is the need of flying capacitor?
10. What does filter do in an inverter?

PART B — (5 × 13 = 65 marks)

11. (a) Discuss the working and outputs of single phase full converter with R-L load with necessary waveforms and equations.

Or

(b) Discuss the effect of source impedance, reactive power and power balance in converter circuit.

12. (a) (i) Illustrate the importance and working of DC drive system.

(ii) Explain the inverter operation in a three phase ac-dc converter.

Or

(b) Discuss the working and outputs of three phase full converter with R-L-E load with necessary waveforms and equations.

13. (a) Explain the working of IGBT based half bridge single phase inverter with necessary waveforms.

Or

(b) Briefly discuss the harmonic elimination technique for inverters.

14. (a) (i) Compare DC and AC drives.

(ii) Illustrate the working of the current source inverter.

Or

(b) Discuss the working and outputs of three phase inverter with delta connected load at 120° conduction mode with necessary waveforms.

15. (a) Explain the principle of various PWM techniques for multilevel inverter.

Or

(b) (i) Compare the merits and demerits of various multilevel inverter.

(ii) Discuss the role of filters in modern inverters.

PART C — (1 × 15 = 15 marks)

16. (a) A single phase thyristor converter consist of one switch has a purely resistive load of R and the delay angle is $\alpha = \pi/2$, determine the rectification efficiency, the form factor, the ripple factor, the transformer utilization factor and the peak inverse voltage of thyristor.

Or

(b) A single phase full bridge inverter has RLC load of $R = 4\Omega, L = 35\,mH$ and $C = 155\,\mu F$. The DC input voltage is 230V and the output frequency is 50Hz.

(i) Find an expression for load current up to 5^{th} harmonic. Also, Calculate

(ii) RMS value of fundamental load current

(iii) The power absorbed by the load and the fundamental power

(iv) The RMS and peak currents of each thyristor

(v) Conduction time of thyristors and diodes if only fundamental component were considered.