M.E. DEGREE EXAMINATION, MAY/JUNE 2006.

First Semester

Power Electronics and Drives

PE 1604 — ANALYSIS OF INVERTERS

(Regulation 2005)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How are inverters classified?

2. What is the advantage of eliminating low frequency harmonics from the output voltage of an inverter?

3. What are the purposes of feedback diodes in inverters?

4. What are the methods for voltage control within the inverters?

5. What are the advantages of current source inverter?

6. What is the effect of thyristor turn off time on inverter frequency?

7. What are the features of a multilevel converter?

8. Mention the possible applications of multilevel inverters?

9. What is the dead zone of a resonant inverter?

10. What are the limitations of zero current switching (ZCS) converters?

PART B — (5 × 16 = 80 marks)

11. (i) With an appropriate power diagram, discuss the principle of working of a three phase bridge inverter. Draw phase and line voltage waveforms on the assumption that each power semiconductor device conducts for 120° and the resistive load is star connected. Also prepare a table which shows the sequence of firing various power semiconductor devices. (10)

(ii) Explain in brief the voltage control of three phase inverters. (6)

12. (a) (i) A single phase half bridge inverter connected to a RLC under damped load. For this load draw the load voltage and load current waveforms under steady state operating conditions. Also indicate the conduction of the various elements of the inverter circuit. (10)

(ii) A single phase full bridge inverter has a resistive load of 10 ohms and the dc input voltage of 100 V. Find (1) rms output voltage at fundamental frequency (2) the output power (P_{out}) (3) Peak and average current of each power device. (6)

Or

(b) (i) State the need for reduction of harmonics in inverters. Outline the various methods for reduction of harmonics or the improvement in wave shape. (10)

(ii) Describe the McMurray inverter? What type of commutation does it apply? What are the expressions for commutating elements? (6)

13. (a) (i) Draw and explain the operation of single phase capacitor commutated current source inverter with resistive load. Draw also the related voltage and current waveform. (10)

(ii) Compare the performance of voltage source inverter with current source inverters. (6)

Or

(b) With a neat power circuit diagram explain the operation of a three phase auto sequential current source inverter. (16)

14. (a) Explain the operation of a diode-clamped multilevel inverter. Also discuss its advantages and disadvantages. (16)

Or

(b) With neat diagram describe the operation of a cascaded multilevel inverter. Also discuss its main features. (16)

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(a)   (i)   Explain the effects of series loading in a series resonant inverter. (8)

       (ii)   Explain, how is the output voltage controlled in the resonant inverters.   (8)

<div align="center">Or</div>

(b)   (i)   Explain the operation of a class E resonant inverter. What are the advantages and limitations of class E resonant inverters?   (10)

       (ii)   Explain, why are dc link resonant inverters ideally lossless.   (6)

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