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Question Paper Code : 13937

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Second Semester

Power Electronics and Drives

PX 7202 — SOLID STATE AC DRIVES

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the different methods of braking applied to induction motor?
2. What is meant by v/f control?
3. What are the effects of harmonics in VSI fed induction motor drives?
4. How is speed controlled in a induction motor?
5. How is static scherbius drive operated in super synchronous motoring mode?
6. What are the causes of harmonic currents in static Kramer drive?
7. What is indirect flux control?
8. What are the advantages of field oriented control of induction motor?
9. How is the machine operation performed in self controlled mode?
10. List out the advantages of load commutation.

PART B — (5 × 16 = 80 marks)

11. (a) Derive the steady state per phase equivalent circuit of Induction motor with suitable mathematical expressions and also draw the performance characteristics. (16)

Or

- (b) (i) Describe the various methods of electric braking for induction motor. (8)
- (ii) A 1-phase, 220V, 50Hz, 1425 rpm induction motor has following parameters: $R_s = 2\Omega$, $R_r = 5\Omega$, $X_s = X_r = 6\Omega$, it drives a fan load at rated speed when full voltage is applied. The motor speed is controlled by the stator voltage control. Calculate the motor terminal voltage for a speed of 1200 rpm. (8)

12. (a) (i) Explain six step inverter voltage controller in an induction motor. (8)
- (ii) With neat sketch explain the voltage controller circuit. (8)

Or

- (b) (i) Explain closed loop speed control of CSI drives. (8)
- (ii) Show that a variable frequency induction motor drive develops at all frequencies the same torque for a given slip-speed when operating at constant flux. (8)

13. (a) Explain the rotor resistance control for induction motor drive with neat sketch and draw its effect on speed torque curve. (16)

Or

- (b) A 3-phase, 400 V, 6-pole, 50 Hz, delta-connected, slip-ring induction motor has rotor resistance of 0.2Ω and leakage resistance of 1Ω per phase referred to stator. When driving a fan load it runs a full load at 4% slip. What resistance must be inserted in the rotor circuit to obtain a speed of 850 rpm. Neglect stator impedance and magnetizing branch. Stator to rotor turns ratio is 2.2. (16)

14. (a) Explain how vector controlled induction motor drive operates like a separately excited DC motor with necessary phasor diagrams. (16)

Or

- (b) Explain in detail about direct torque control of induction machines. (16)

15. (a) (i) Explain the Open loop v/f control of Synchronous motor in detail. (8)
- (ii) Explain the concept of self controlled Synchronous motor drive. (8)

Or

- (b) Explain the construction and working of Permanent Magnet Synchronous motor. (16)