C 61457 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2014

EE/PTEE 09 604—ELECTRIC DRIVES

(2009 Scheme)

[Regular/Supplementary/Improvement]

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Name one suitable motor for cranes, stating the reason.
2. Draw the typical speed torque curve of a fan type load.
3. What are the possible quadrants of operation of a semiconductor fed d.c. drive system ?
4. In Scherbins scheme of induction motor control, if the d.c. link current is doubled, how much the total copper loss P_{cr} will increase/decreases ?
5. Give any *two* applications of synchronous drives.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. A weight of 500 kg. is being lifted up to at a uniform speed of 1.5 m/s by a winch drive by a motor running at a speed of 1000 r.p.m. The moments of inertia of the motor and winch are 0.5 kg.-m.^{2} and 0.3 kg.-m.^{2} respectively. Calculate the motor torque and equivalent moment of inertia referred to the motor shaft. In the absence of weight, motor develops a torque of 100 N-m when running at 1000 r.p.m.
7. A drive has following parameters :

   $J = 10$ kg.-m.^{2}

   $T_M = 100 - 0.1$ N, N-m

   T_L (passive) = 0.05 N, N-m.

   Where N is the speed in r.p.m. Then find the steady-state speed.
8. Explain principle of operation of chopper-feed d.c. drives.
9. What are the advantages of a.c. drives over d.c. drives ?

Turn over

10. Describe the conventional Scherbins scheme of slip energy recovery and enumerate its drawback.

11. Explain the self-control mode of a synchronous motor.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. Explain the following control methods for an electric drive :

    (i) Closed loop torque control.

    (ii) Closed loop speed control.

    (iii) Closed loop position control.

Or

13. (a) Explain "steady-state stability" of an electric drive.

    (b) Explain multiquadrant operation of an electric drive.

14. Explain three-phase fully controlled rectifier control of d.c. separately excited motor.

Or

15. Explain the closed-loop control scheme for d.c. motor drive below and above the base speed.

16. Explain closed-loop current source invertor (CSI) control of a three-phase induction motor. How multiquadrant operation is achieved using this drive ?

Or

17. Explain the working of CSI controlled induction motor drive with neat sketch.

18. Explain the operation of 3ϕ brushless d.c. motor drive, with necessary waveforms.

Or

19. Describe the principle of operation of switched reluctance motor. What are the advantages of SRM over other a.c. drives ?

(4 × 10 = 40 marks)