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H 2191

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2009.

Third Semester

Mechanical Engineering

EE 252 — ELECTRICAL MACHINES AND DRIVES

(Common to Mechatronics Engineering)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give any four classes of duty.
2. What is a load diagram?
3. Sketch the speed torque characteristics of a DC compound motor.
4. What is meant by regenerative braking?
5. Why are squirrel cage induction motors not used for loads requiring high starting torque?
6. What are the protective devices in a DC/AC motor Starter?
7. Give the expression for speed for a DC motor.
8. What are the main drawbacks of Ward-Leonard system?
9. What are the different methods of providing neutral earthing?
10. What is Buck boost control?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the merits and demerits of electric drives. (6)
(ii) Explain the various types of loads with relevant sketches. (10)

Or

- (b) Write short notes on :
- (i) Electrical characteristics of drive
 - (ii) Mechanical characteristics of drive
 - (iii) Size and rating of electric motor. (5 + 5 + 6)
12. (a) Explain torque speed characteristics of a dc shunt and d.c series motor with derivation to justify their shape. (16)

Or

- (b) (i) Explain how an induction motor is brought to stop by plugging. (8)
- (ii) A 50 cycle, 8 pole induction motor has a full load slip of 4%. The rotor resistance and reactance is 0.01Ω and 0.1Ω per phase respectively. Find the ratio of the maximum to full load torque and the speed at which the maximum torque occurs? (8)
13. (a) Explain with a neat sketch the working of a dc motor starter using voltage sensing relays. (16)

Or

- (b) With a neat sketch, explain the auto transformer starting of an induction motor. Derive necessary relations and compare the starting torque produced with others. (16)
14. (a) A 400V series motor takes a current of 40A and runs at a speed of 500 rpm. What resistance should be connected in series with the armature to reduce the speed to 400 rpm? Load torque at this new speed is 75% of its previous value. The resistances of armature and series field are 0.075Ω and 0.025Ω respectively. Assume that flux is proportional to load. (16)

Or

- (b) Explain how the speed of a d.c. shunt motor can be varied both above and below the speed at which it runs with full field current. (16)
15. (a) Explain the chopper circuits used to control the speed of D.C. motors. (16)

Or

- (b) Explain the principle of stator voltage control and voltage/frequency control scheme of induction motor. (16)