

Time: 3 hours

Marks: 80

Instructions:

- Question No: 1 is compulsory.
- Answer any three from the remaining five questions.
- Figures to the right indicate full marks.
- Answers to questions should be grouped and written together.

- Q1** a) State the main factors which decide the choice of electrical drive **20**
 b) Illustrate dynamic braking and plugging in a DC series motor
 c) Prove that the energy loss during stopping by plugging is $\frac{3}{2}J\omega_{ms}^2$
 d) How to select a motor for continuous duty?
- Q2** a) Explain in details the components of load torque. **10**
 b) A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a winch driven by a motor running at a speed of 1000 rpm. The moment of inertia of motor and winch are 0.5 and 0.3 kg-m² 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 rpm. **10**
- Q3** a) Explain the operation of closed loop speed control scheme with inner current control loop. What are the various functions of inner current control loop **10**
 b) What do you understand by steady state stability? What is the main assumption? Derive the inequality constraints for steady state stability condition. **10**
- Q4** a) Define intermittent periodic duty and short time duty. Derive over loading factor in both cases. **10**
 b) How a chopper fed DC separately excited DC motor operate in motoring and regenerative braking mode. Develop ω vs T relation and draw speed torque characteristics **10**
- Q5** a) Describe the operation dynamic braking of an induction motor **06**
 b) Illustrate with neat circuit diagram the static rotor resistance control. Also show that the effective rotor resistance increased by $0.5R(1 - \delta)$ **08**
 c) What are the reasons for using load equalization in an electrical drive? **06**
- Q6** a) Describe the operation of stepper motor along with its driver circuit **10**
 b) What is the basic principle of Direct torque control method? Explain with block diagram. **06**
 c) Derive fundamental torque equation and mention the significance of dynamic torque **04**
