

(3 Hours)

[ Total Marks :80

- N.B. :** (1) Question No.1 is **compulsory**.  
 (2) **Attempt** any **three** questions out of remaining questions.  
 (3) **Figures** to the **right** indicate **full** marks.  
 (4) **Assume** suitable **data** if **necessary**.

1. Attempt the following. 20
- Write in brief about 'current status of AC and DC drives'.
  - Explain 'chopper controlled braking of separately excited DC motor'-any one.
  - Explain 'Regenerative braking of 3-ph Induction motor'
  - Explain a unipolar driver circuit of stepper motor.
2. (a) Write a note on 'BLDC motor drive'. 10  
 (b) What is 'steady state stability of drive'? A drive has following parameters 10  
 $J = 10 \text{ (Kg-m}^2\text{)}$ ,  $T = 100 - 0.1N \text{ (N-m)}$ ,  $T_1 = 0.05N \text{ (N-m)}$   
 where  $N$  is speed in rpm. Initially the drive is operating in steady state. Now it is to be reversed. For this the motor characteristic is changed to  $T = -100 - 0.1N$ . Calculate the time of reversal.
3. (a) A motor driving colliery winding equipment has to deliver a load having the 10  
 following characteristics.
- Raising uniformly from zero to maximum of 2000 KW in 20 sec, during the accelerating period.
  - 1000 KW for 40 sec during the full load speed period.
  - During acceleration period of 10 sec when regenerative braking takes place, the power returned to supply falls from an initial value of 330 KW to zero.
- The interval of decking the next load cycle is 20 sec. What size of continuously rated motor would be suitable? State the assumptions made.
- (b) Explain Direct torque control of Induction motor with the help of block diagram. 10
4. (a) Explain closed loop speed control of drive and state why inner current loop is 10  
 essential.
- (b) Explain 1- $\phi$  fully- controlled rectifier control of dc separately excited motor 10  
 with discontinuous conduction mode of operation. Also draw its speed - torque characteristics.

TURN OVER

5. (a) Explain four quadrant operation of hoist. 16  
(b) A 400 V, star connected 3ph, 6 pole, 50 Hz Induction motor has following parameters referred to stator. 10  
 $R_s = R_r' = 1 \Omega$ ,  $X_s = X_r' = 2 \Omega$   
for regenerative braking determine-  
(1) maximum torque and range of speed for safe operation  
(2) Speed at which it will hold load with torque 100 Nm
6. (a) Draw and explain 'Static Scherbius drive'. 10  
(b) Explain V/f method of speed control. 10

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