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10EE74

**Seventh Semester B.E. Degree Examination, Aug./Sept.2020**  
**Industrial Drives and Application**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART - A**

- 1 a. Obtain fundamental torque equation of a motor load system. (06 Marks)  
b. Explain various components of load torque, with a neat curve. (06 Marks)  
c. A drive has following parameters  $J = 10 \text{ kg} - \text{m}^2$ ,  $T = 100 - 0.1N \text{ N-m}$ . Passive load torque  $T_L = 0.05N \text{ N-m}$ , where  $N$  is speed in rpm. Initially the drive is operating in steady state. Now for the purpose of reversing the motor, the characteristic of the molar is changed to  $T = -100 - 0.1N \text{ N-m}$ . Calculate the time taken to reverse. (08 Marks)
- 2 a. Explain the following classes of motor duty with load diagram :  
i) Intermittent periodic duty with starting and braking.  
ii) Continuous duty with intermittent periodic loading. (06 Marks)  
b. Determine the expression of overloading factor  $K$  while selecting the motor rating for intermittent periodic duty. (08 Marks)  
c. Select the molor for driving the equipment which has the load curve as follows :  
i) First 10 sec torque is constant and equal to  $41 \text{ kg} - \text{m}$ .  
ii) For next 30 sec torque drops linearly from  $38 \text{ kg} - \text{m}$  to  $17 \text{ kg} - \text{m}$ .  
iii) For last 46 sec torque is constant at  $8 \text{ kg} - \text{m}$ . (06 Marks)
- 3 a. With a neat graph, explain the regenerative and dynamic type of braking system for separately excited DC motor. (10 Marks)  
b. A 200V, 875 rpm, 150A separately excited dc motor has an armature resistance of  $0.06\Omega$ . It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V, 50Hz. Assuming continuous conduction, calculate  
i) Firing angle for rated motor torque and 750 rpm.  
ii) Firing angle for rated torque and -500 rpm.  
iii) Motor speed for  $\alpha = 160^\circ$  and rated torque. (10 Marks)
- 4 a. With the help of drive circuit of a dc motor, explain the operation of three phase fully controlled rectification control. (10 Marks)  
b. With circuit diagram and waveform, explain the chopper control of dc series motor. (10 Marks)

**PART - B**

- 5 a. Explain with relevant equations the operation of induction motor with unbalanced voltage source. (08 Marks)  
b. Explain Reverse voltage braking of induction motor. (04 Marks)  
c. A 400V, Y connected, 3 phase, 6 pole, 50Hz induction motor has following parameters referred to the stator.  $R_s = R'_r = 1\Omega$ ,  $X_s = X'_\sigma = 2\Omega$ . For regenerative operation of this motor, determine i) Maximum over hauling torque it can hold and range of speed for safe operation ii) Speed at which it will hold an overhauling load with a torque of 100Nm. (08 Marks)

- 6 a. Draw a neat circuit arrangement of static Scherbius drive. Explain its importance. (08 Marks)  
b. Explain variable frequency control of an induction motor and mention its features. Draw the speed torque curve. (07 Marks)  
c. List the relative advantages and disadvantages of CSI and VSI drives. (05 Marks)
- 7 a. Explain the self controlled synchronous motor drive, employing load commutated thyristor inverter. (10 Marks)  
b. Explain starting and pull in process in synchronous motor operation from fixed frequency supply. (10 Marks)
- 8 a. Explain the reversing and continuous hot rolling mill drives with selection of motors and their ratings. (08 Marks)  
b. List the required features for different cement mill drive. (06 Marks)  
c. Write the comparison between the line shaft drive and sectional drive of paper mill drive. (06 Marks)

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