CBCS SCHEME

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15EE82

Eighth Semester B.E. Degree Examination, November 2020
Industrial Drives and Applications

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions irrespective of modules.

Module-1

1 a. With basic block diagram, explain the essential parts of electric drive. **(05 Marks)**

b. Explain the speed torque conventions and multiquadrant operations of a motor driving a hoist load. **(08 Marks)**

c. What are the advantages of an electrical drive system? **(03 Marks)**

2 a. Obtain an expression for the equivalent load torque and equivalent moment of inertia for loads rotational and translational motion. **(08 Marks)**

b. A 3 phase, 50KW, 6 pole, 960rpm, induction motor has a constant load torque of 300N-m and at wide intervals additional torque of 1500N-m for 10 seconds. Calculate :

i) The weight of fly wheel used for load equalization, if the motor torque were not to exceed twice the rated torque and the radius of gyration is 0.9mm

ii) The time taken after removal of additional load before the motor torque becomes 700N-m. Assume that the induction motor operates at that portion of the slip torque characteristics which is linear. **(08 Marks)**

Module-2

3 a. Explain the following classes of motor duty with necessary diagram showing variation of load, electrical losses and temperature with respect to time, also mention the cyclic duration factor for each case.

i) Intermittent periodic duty with starting and braking

ii) Continuous duty with starting and braking. **(08 Marks)**

b. With a neat circuit and graph, explain the regenerative, dynamic and plugging type of braking system for separately excited DC shunt motor. **(08 Marks)**

4 a. Explain with circuit diagram and relevant waveforms, a single phase fully controlled rectifier, control of a separately excited DC motor. **(08 Marks)**

b. Explain with a neat sketch, the dynamic braking of a separately excited DC motor. **(08 Marks)**

Module-3

5 a. Explain with relevant equations the operation of induction motor with unbalanced source voltage. **(08 Marks)**

b. Explain the DC dynamic braking of 3-phase induction motor. **(08 Marks)**

6 a. Explain the reverse voltage braking of an induction motor. **(04 Marks)**

b. A 2200V, 50Hz, 3 phase, 6 pole star connected squirrel cage induction motor has the following parameters : $R_S = 0.075\Omega$, $R_r^1 = 0.12\Omega$, $X_S = X_r^1 = 0.5\Omega$. The combined inertia of motor and load is 100kg-m^2.

i) Calculate time taken and energy dissipated in the motor during starting

ii) Time taken to stop the motor by plugging. **(04 Marks)**

c. A 400Volts, star connected 3phase, 6pole, 50Hz induction motor has following parameters referred to stator. $R_S = R_r^1 = 1$ohm, $X_S = X_r^1 = 2$ohm. For regenerative braking operation. Calculate the overhauling torque and range of speed operation. **(08 Marks)**

Module-4

7 a. With a neat circuit diagram and relevant waveforms, explain the operation of voltage source inverter drive system. **(08 Marks)**

b. Draw a neast circuit arrangement of static scherbius drives, explain its importance. **(08 Marks)**

8 a. With a neat drive circuit, explain the static scherbius drive. **(08 Marks)**

b. A 3 phase, 440V, 50Hz, 6pole Y-connected induction motor has the following parameters referred to the stator : $R_S = 0.5\Omega$, $R_r = 0.6\Omega$, $X_S = X_r^1 = 1\Omega$ stator to rotor Turing ratio is 2. If the motor is used for regenerative braking determine :

i) Maximum over hauling torque it can hold and the range of speed in which it can safely operate.

ii) The speed at which it will hold a load torque of 160N-m. **(08 Marks)**

Module-5

9 a. Explain the operation of self controlled synheonous motor drive employing load commentated thyristor inverter. **(08 Marks)**

b. Draw the block diagram of variable frequency control of multiple synchronous motor and explain. **(08 Marks)**

10 Write short notes on :

a. Steel rolling mill drive system

b. Cement mill drives

c. Paper mill drive. **(16 Marks)**

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