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10EE74

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018

Industrial Drives and Applications

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. Briefly explain the different power modulators that used in drive system. (06 Marks)
b. With the help of quadrantal diagram, explain four-quadrant operation of a motor driving a hoist load. (10 Marks)
c. Define active load torque and passive torque. Give an example. (04 Marks)

- 2 a. Explain the steady state stability in the drive system. (05 Marks)
b. Explain standard classes of motor duty with load diagram. (08 Marks)
c. A motor has heating-time constant of 70 min and a cooling time constant of 90 min. When run continuously on full load of 400 kW, final temperature rise is 50°C.
i) When used in short time periodic duty cycle consisting of loaded period of 10 min followed by no-load period long enough for the motor to cool down. What will be the maximum load that motor can carry?
ii) Determine the maximum load the motor can deliver when subjected to intermittent periodic load cycle consisting of a load period of 10 min followed by a no-load period of 15 min. (07 Marks)

- 3 a. Explain the dynamic braking of separately excited DC motor. (06 Marks)
b. A 220 V, 200 A, 800 rpm separately excited DC motor has an armature resistance of 0.06 Ω. The motor armature is fed from a variable voltage source with an internal resistance of 0.04 Ω. Calculate internal voltage of the variable voltage source when the motor is operating in regenerative braking at 80% of the rated motor torque and 600 rpm. (06 Marks)
c. Explain the operation of continuous conduction mode of a single-phase fully controlled rectifier control of separately excited DC motor. (08 Marks)

- 4 a. A 220 V, 1500 rpm, 10 A separately excited dc motor is fed from a single-phase fully controlled rectifier with an AC source voltage of 230 V, 50 Hz, $R_a = 2 \Omega$. Conduction can be assumed to be continuous, calculate firing angle for:
i) Half the rated motor torque and 500 rpm
ii) Rated motor torque and -1000 rpm. (08 Marks)
b. Explain the multiquadrant operation of a separately excited DC motor using single-phase fully controlled rectifier with a reversing switch. (06 Marks)
c. Explain the regenerative braking of separately excited DC motor by chopper control. (06 Marks)

PART - B

- 5 a. What is single phasing? Explain the operation of a 3-phase induction motor with unbalanced voltages. (07 Marks)

Important Note : 1 On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

- b. A 2200 V, 50 Hz, 3 phase, 6 pole, Y connected, squirrel cage induction motor has following parameters: $R_s = 0.075 \Omega$, $R'_r = 0.12 \Omega$, $X_s = X'_r = 0.5 \Omega$. The combined inertia of motor and load is 100 kg-m^2 . Calculate time taken and energy dissipated in the motor during starting. (08 Marks)
- c. Explain the reverse voltage braking (plugging) of an induction motor. (05 Marks)
- 6 a. Explain the available frequency control of an induction motor and mention any two features. (07 Marks)
- b. Explain the operation of a voltage source inverter fed induction motor drive. (07 Marks)
- c. Explain the static rotor resistance control. (06 Marks)
- 7 a. Explain pull-in process in synchronous motor operation from fixed frequency supply. (05 Marks)
- b. Explain the modes of variable frequency control of synchronous motors. (05 Marks)
- c. Explain the operation of self controlled synchronous motor drive employing load commutated thyristor inverter. (10 Marks)
- 8 a. With schematic diagram, explain the paper mill drive. (10 Marks)
- b. With schematic diagram, explain the cement mill. (10 Marks)
