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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 multi-quadrant 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)

- 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)
