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10EE74

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
Industrial Drives and Applications

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1
 - a. What are the advantages of an electric drive system? (05 Marks)
 - b. With a neat block diagram, state the essential parts of an electric drive system. Briefly explain. (08 Marks)
 - c. Determine the expression of over-loading factor 'K' while selecting the main rating, for short time duty class. (07 Marks)

- 2
 - a. Obtain the thermal model of motor for heating and cooling. Also briefly explain heating and cooling curves. (10 Marks)
 - b. A thyristor fed dc motor has following specifications: Rated armature current is 700A, armature resistance is 0.01 ohms. The drive operates on following duty cycle.
 - i) Acceleration at twice the rated armature current for 15sec.
 - ii) Running at full load for 20 sec.
 - iii) De acceleration at twice the rated armature current for 15sec.
 - iv) Idling interval.
 The core loss is constant at 1kW. If B has value of 0.5. Determine the maximum frequency of drive operation. (10 Marks)

- 3
 - a. With a neat circuit and graph, explain dynamic and plugging type of braking system for separately excited DC motor. (10 Marks)
 - b. Controlled rectifier with an a.c. source voltage of 230V, 50Hz, $R_a = 2\Omega$. Conduction can be assumed to be continuous. Calculate the firing angles for
 - i) Half the rated motor torque and 500rpm.
 - ii) Rated motor torque and -1000 rpm. (10 Marks)

- 4
 - a. With neat circuit diagrams and waveforms explain three phase fully controlled rectifier control of DC separately excited motor. (10 Marks)
 - b. Give the comparison of conventional and static Ward Leonard schemes. (05 Marks)
 - c. A 230V, 960rpm, 200A separately excited motor has an armature resistance of 0.02Ω . The motor is fed from a chopper which provides dynamic braking with a braking resistance of 2Ω .
 - i) Calculate duty ratio of chopper for a motor speed of 600rpm and braking torque of twice the rated value.
 - ii) What will be the motor speed for duty ratio of 0.6 and motor torque equal to twice its rated value? (05 Marks)

2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – B

- 5 a. A 440V, 50Hz, 6 pole, 950 rpm, Y – connected induction motor has following parameters referred to the stator: $R_s = 0.5\Omega$, $R'_r = 0.4\Omega$, $X_s = X'_r = 1.2\Omega$, $X_m = 50\Omega$. Motor is driving a fan load, the torque of which is given by $T_L = 0.0123 W_m^2$. Now one phase of the motor fails. Calculate motor speed and current. Will it be safe to allow the motor to run for a long period? (12 Marks)
- b. Show that time required for stopping by plugging is
- $$t_b = \tau_m \left[0.345 s_m + \frac{0.75}{s_m} \right]$$
- where τ_m is the mechanical time constant of motor and s_m is the slip at maximum torque. Also find the corresponding value of rotor resistance. (08 Marks)
- 6 a. With neat diagram explain the operation of voltage source inverter fed induction motor drives. What are the different schemes of VSI fed induction motor drive? (10 Marks)
- b. With a neat circuit diagram, explain the static Scherbius drive. (10 Marks)
- 7 a. With neat circuit diagram, explain the self controlled synchronous motor drive, employing the load commutated thyristor inverter. (12 Marks)
- b. With neat block diagram, explain the operation of variable frequency control of multiple synchronous motor drive. (08 Marks)
- 8 a. Classify and explain the drives used in cement industry. (10 Marks)
- b. Explain the various stages in paper mill and motors used in various stages. (10 Marks)

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