

USN

--	--	--	--	--	--	--	--	--	--

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)

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

$$t_b = \tau_m \left[0.345s_m + \frac{0.75}{s_m} \right]$$

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)

* * * * *