

GANPAT UNIVERSITY
M.TECH SEM-II (ELECTRICAL)
REGULAR EXAMINATION APRIL-JUNE 2016
3EE204: ELECTRICAL DRIVES

Time: 3 Hours

Total Marks:-60

Instructions: - 1. Attempt all questions.

2. Make suitable assumptions wherever necessary.

3. Figures to the right indicate full marks.

SECTION-I

- Que.-1 (A) What are the main factors which decide the choice of electrical drive for a given application? [05]
- (B) A motor drive two loads. One has rotational motion. It is coupled to motor through a reduction gear with a = 0.1 and efficiency of 90%. The load has moment of inertia of 10 m^2 and torque of 10 N-m. Other has translational motion and consists of 1000 kg weight to be lifted up at uniform speed of 1.5 m/s. coupling between this load and motor has an efficiency of 85%. Motor has inertia of 0.2 kg-m^2 . And runs at constant speed of 1420 rpm. Determine equivalent inertia referred to motor shaft and power developed by the motor [05]
- OR**
- Que.-1 (A) Derive the expressions of Torque for rotational and translational systems. [05]
- (B) Separately excited DC motor with following parameters: $R_a = 0.5 \Omega$, $L_a = .003 \text{H}$ and $K_b = 0.8 \text{ V /rad/sec}$. is driving a load of $J = 0.0167 \text{ kg-m}^2$, $B_l = 0.01 \text{ N-m/rad/ sec}$ with a load torque of 100 N-m. Its armature is connected to dc supply of 220V and given the rated field current. Find the speed of the motor. [05]
- Que.-2 (A) Draw and explain discontinuous modes of operation of a 1- Phase fully controlled rectifier fed dc motor. [05]
- (B) A 200V, 10.5 A, 2000 rpm DC Shunt Motor has the armature and field resistances of 0.5Ω and 400Ω respectively. It drives a load whose torque is constant at rated motor torque. Calculate motor speed if source voltage drops to 175V. [05]
- OR**
- Que.-2 (A) A 220V, 500 A, 600 rpm separately excited DC Motor has armature and field resistance of 0.02Ω and 10Ω respectively. The load torque is given by the expression $T_L = 1100 \text{ N-m}$. Speeds below rated are obtained by armature voltage control and Speeds above the rated are obtained by field control. Calculate [06]
- (i) Motor terminal voltage and armature current when speed is 450 rpm.
- (ii) Field winding voltage and armature current when speed is 750 rpm.
- (B) Describe class B chopper circuit for speed control of DC motor. [04]
- Que.-3 **Attempt following questions.**
- (A) Compare AC Drives with DC Drives. [05]
- (B) Draw and explain sensing of current in three phase ac lines. [05]
- OR**
- (B) Describe:
- (i) Current Limit Control [05]
- (ii) Closed loop torque control

SECTION-II

- Que.-4 (A) Explain some of the special design induction motors with required diagrams. [05]
- (B) A 2200 V, 2600 kW, 735rpm, 50 Hz, 8 pole, 3-phase squirrel cage induction motor has following parameters referred to the stator: $R_s = 0.075 \Omega$, $R_r' = 0.1 \Omega$, $X_s = 0.45 \Omega$, $X_r' = 0.55 \Omega$. Stator winding is delta connected and consists of two sections connected in parallel. (i) Calculate starting torque and maximum torque as a ratio of rated torque, if the motor is started by star-delta switching. (ii) Calculate transformation ratio of an auto-transformer so as to limit the maximum starting current to twice the rated value. What is the value of starting torque?

OR

- Que.-4 (A) List the starting methods for induction motor and explain Auto transformer starting. [05]
- (B) Which are the different types of dynamic braking? With proper sketches discuss about dc dynamic braking method. [05]
- Que.-5 (A) Discuss the pole amplitude modulation method of speed control. [05]
- (B) Explain Static Scherbius Drive for slip power recovery method with the close loop diagram. [05]

OR

- Que.-5 (A) A 400 V, 2.8 kW, 1370 rpm, 50 Hz, 4 pole, delta connected squirrel cage induction motor has following parameters referred to the stator: $R_s = 2 \Omega$, $R_r' = 5 \Omega$, $X_s = X_r' = 5 \Omega$, $X_m = 80 \Omega$. Motor speed is controlled by stator voltage control and it runs at rated speed and rated voltage. Calculate motor terminal voltage, current and torque at 1200 rpm. [05]
- (B) Draw and explain close loop slip controlled PWM inverter drive with regenerative braking. [05]
- Que.-6 **Attempt following questions.**
- (A) Derive the expression for torque of a cylindrical wound field motor with the help of equivalent circuit and neat phasor diagram. [05]
- (B) Write a note on variable frequency control of multiple synchronous motor. [05]

OR

- (B) Explain self-controlled synchronous motor drive with load commutated thyristor inverter. [05]

END OF PAPER