National Institute of Technology, Hamirpur (HP)-177005

Dr. Bharal Bhushan then 9,

Name of the Examination: B.Tech. (End-Semester Examination)					
Branch	:Electrical Engineering	Semester	:6 th		
Course Name	:Electric Drives	Course Code	: EE-324		

Time: 3 Hours

- Note: (i) Attempt all the questions. All parts of a given question should be attempted in continuation. (ii) Assume any missing data while making suitable explanation for the choice made.

Q. No.1: Explain multi-quadrant operation of electric drives by taking into consideration a hoist loading. Also draw the suitable diagram for explaining forward and reverse motoring and braking modes.

Q. No.2: An electric drive has following parameters:

Moment of Inertia J = 10 kg- m^2 ;

Torque developed by Motor as T_M = 120-0.25N, N-m;

Passive load torque as $T_L = 0.05$ N, N-m where N is the speed in rpm.

Assume that initially the drive is working in steady state. Now, the drive is required to be reversed. For this, the motor torque characteristics is given by T = -120-0.15N, N-m. Calculate the time of reversal for the drive.

(5)**Q. No.3:** How to obtain equivalent moment of inertia (J_{eq}) and equivalent torque component (T_{eq}) of motor-load system with (i) Loads associated with rotational motion and (ii) Loads associated with translational motion. Explain in detail with the help of suitable block diagram.

(5) **Q. No. 4:** A motor used in industrial application as drive develops torque $T_M = Aw + B$; where A and B are positive constants. The motor drives a load whose torque termed as load torque is given by $T_L = Cw^2 + D$ with C and D as some other positive constants. Here, w is speed of motor and the total inertia of the rotating mass is given by J. (i) Find out the relations among the constants A, B, C & D respectively, so that the motor can start together with the load and have an equilibrium operating speed; (ii) Calculate the equilibrium operating speed; (iii) Check whether the drive is stable or not; and (iv) Determine initial and maximum acceleration of the drive.

Q. No. 5: A 100 KW motor has a heating time constant of 1hour and cooling time constant of 2 hours, respectively. Assume that iron losses which remain constant are 80% of the copper losses at full load. (i) What will be the load delivered by the motor for 15 minutes duty if the same is followed by a long rest period of cooling, and (ii) If the motor is put on intermittent duty of load of 20 minutes followed by 20 minutes shut down, then what would be the maximum value of load that can be supplied by the motor during on load period.

Q. No.6: Explain the working of single phase fully controlled rectifier control of separately excited DC Motor. Also draw and (6)explain the waveforms for continuous and discontinuous mode of conduction of such motor.

Q. No.7: What are important stator control methods of speed control of Induction motors? Explain in detail	
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Q.N	0.8:	Explain	anv	three	of the	following.	
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- (a) Brushless DC Motors
- (b) Direct Online Starter of Low rating Induction Motors
- (c) Continuous Duty, Short-time and Intermittent Periodic Duty of motors
- (d) Static Scherbius drives for slip power recovery
- (e) Voltage Source Inverters (VSI)
- (f) Self-controlled synchronous motor drive

Maximum Marks: 50

(5)

2023

(6)

(6)

3x4=(12)