

JK Lakshmipat University Jaipur

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2021A
B. Tech. in Electrical Engineering, Semester VII

Course Code: EE1206 Industrial Drive and E-Vehicles

Roll No.....
Time: 2:30 hours Max. Marks: 20

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Answer all questions

(1)	An industry needs to shift man or material from ground floor to higher floor and also same from higher floor to ground floor. Design an electric drive system for above application and analyses it's four quadrant operation.	[3]
(2)	A drive system has following parameters: $J = 10 \text{ kg.m}^2$, $T = 100 - 0.1N$, N-m, Passive load torque $T_L = 0.05N$, N-m Where N is the speed in rpm Initially the drive is operating in steady state. The characteristic of load torque is changed to $T_L = -100 - 0.1N$, N-m. Calculate the time of reversal.	[3]
(3)	Design a 3-phase fully controlled converter fed separately excited dc motor drive to drive the load from no load to rated load and draw the mechanical characteristic of the motor.	[2]
(4)	A 200-volt, 900 rpm and 100 Amp separately excited dc motor has an armature resistance of 0.01 ohm. The motor is fed from a chopper which provide both motoring and braking operations. The source has a voltage of 200 volt. i. Calculate the duty ratio of chopper for motoring operation at rated torque and 300 rpm. ii. Calculate the duty ratio of chopper for braking operation at double the rated torque and 400 rpm. OR A 200-volt, 900 rpm, 200 amp separately excited dc motor has an armature resistance of 0.05 ohm. It is fed from a single phase fully controlled rectifier with an AC source voltage of 220 V, 50 Hz. Calculate i. Firing angle for rated motor torque and 500 rpm. ii. Firing angle for rated motor torque and (-800) rpm.	[3]
(5)	A 3-phase, 50 Hz, 4 pole induction motor is running at 1440 rpm and rotor input power is 2KW. Find the rotor copper loss and mechanical power developed by the motor?	[2]
(6)	A Y-connected squirrel cage induction motor has following rating and parameters: 400-volt, 50 Hz, 6-pole, 900 rpm, $R_2' = 2 \text{ ohm}$ $X_1 = 3 \text{ ohm}$, $X_2 = 3 \text{ ohm}$	[3]

	Motor is controlled by a voltage source inverter at constant V/f ratio. Inverter allows frequency variation from 10 to 50 Hz. - Calculate the value of slip at rated load - Value of maximum torque at fundamental frequency. - Obtain a plot between the breakdown torque and frequency. - Calculate the starting torque and current of this drive as a ratio of their values when motor is started at rated voltage and frequency. OR A 6-pole 3-phase, 50 Hz induction motor develop a maximum torque of 30 N-m at 960 rpm. Determine torque exerted by the motor at 5% slip. The rotor resistance per phase is 0.6 ohm.	
(7)	Draw the schematic diagram of an electric vehicle and Discuss - Overall emissions, including the vehicle and the power plant. - Cost to Charge at Charging Station. - Electric motor used for E-vehicles	[4]