



PRESIDENCY UNIVERSITY

BENGALURU

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Mid - Term Examinations – March 2026

Date: 13- 03-2026

Time: 11.45am to 01.15pm

School: SOE	Program: B. Tech. / EEE		
Course Code: EEE3001	Course Name: Electrical Drives		
Semester: VI	Max Marks: 50	Weightage: 25%	

CO - Levels	C01	C02	C03	C04	C05
Marks	26	24	-	-	-

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x 2M=10M

1	The main philosophy in Electrical Drives is that the motor speed torque (T) characteristics are controlled/shaped by the power converter according to the requirement of the industrial load torque (Tl) characteristics. What would be the sign of dynamic torque during acceleration and braking?	2 Marks	L1	C01
2	An elevator installed in an apartment is an example of an electrical drive. In order to understand the conventions of motor torque, load torque, and speed, what would be the order of weights of the empty cage, loaded cage, and counter weight?	2 Marks	L1	C01
3	A WAP5 locomotive engine is used for traction by Indian railways. What are the supply voltage specifications of locomotive.	2 Marks	L1	C01
4	A 220 V, 10.5 A, 1300 rpm separately excited DC motor is used for a wood cutting application; A DC shunt motor is controlled by a single-phase controlled rectifier. It is required to obtain the maximum output voltage	2 Marks	L3	C02

	from the converter. Determine the value of the firing angle of the rectifier?			
5	A 180 V, 8 A, 1500 rpm separately excited DC motor is used for a metal cutting application. The DC shunt motor is controlled by a single-phase fully controlled rectifier. Calculate the value of the maximum voltage of the converter to control the motor?	2 Marks	L3	CO2

Part B

Answer the Questions

Total Marks 40M

6.	a.	Draw the block diagram of an electric drive system and explain the function of each block in detail. Select any one suitable application for an electric drive and justify it with reference to the block diagram?	10 Marks	L3	CO1																									
	b.	An Induction motor in a paper mill drives four loads. Two have rotational motion, and two have translational motion. The moment of inertia of the motor is $3 \text{ kg} \cdot \text{m}^2$. Motor runs at a speed of 1500 rpm. The following are the details presented in Table 1. Calculate the Eq. moment of Inertia of the motor drive system. Table.1 <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Load</th> <th>Type of Motion</th> <th>Speed</th> <th>Inertia/Mass</th> <th>Torque/Force</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>Rotational</td> <td>300rpm</td> <td>8kg-m²</td> <td>10 N-m</td> </tr> <tr> <td>II</td> <td>Rotational</td> <td>200rpm</td> <td>5kg-m²</td> <td>6 N-m</td> </tr> <tr> <td>III</td> <td>Translational</td> <td>5m/sec</td> <td>10kg</td> <td>20N</td> </tr> <tr> <td>IV</td> <td>Translational</td> <td>10m/sec</td> <td>20kg</td> <td>30N</td> </tr> </tbody> </table>	Load	Type of Motion	Speed	Inertia/Mass	Torque/Force	I	Rotational	300rpm	8kg-m ²	10 N-m	II	Rotational	200rpm	5kg-m ²	6 N-m	III	Translational	5m/sec	10kg	20N	IV	Translational	10m/sec	20kg	30N	10 Marks	L3	CO1
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7.	a.	An electrical motor is used as a traction motor for electric vehicle application and has following parameters $J=10 \text{ kg-m}^2$, $T=100-0.1N$, N-m, and the passive load torque $T_l= 0.05N$, N-m where N is in rpm. At the time of braking, the motor characteristic is changed to $T=-100-0.1N$, N-m. (i) Compute the new equilibrium speed? (ii) If the motor torque is changes its polarity, compute the new equilibrium speed. (iii) If the Moment of Inertia is changed to 15 kg-m^2 , Comment on the equilibrium speeds.	10 Marks	L3	CO 1																									
	b.	In a cement manufacturing plant, the cooling fan is controlled by an electric drive. The motor and load torque characteristics are given as $T = (1 - 2\omega_m)$ and $T_l = -3\sqrt{(\omega_m)}$. i. Compute the steady-state operating points. ii. Comment on the reason for the stability or instability of the drive system. iii. Comment on the stability if the load torque is reversed.	10 Marks	L3	CO1																									

8.	a.	Describe the performance equations of dc shunt motor and identify the suitable control parameters to vary the speed and torque of a dc shunt motor.	10 Marks	L3	C02
	b.	<p>A ABB make Model M3BP250MLB3, 220 V, 10 A, 2000 rpm DC shunt motor is used in heavy-duty material handling crane. While lifting and lowering loads, it is required to rotate at a speed of 800 rpm in both directions at rated torque. The available power converters in the workshop are a single-phase fully controlled rectifier and a single-phase semi-converter, both fed with a 1-phase 400 V, 50 Hz supply.</p> <p>i. Choose the suitable converter for the application and justify it. ii. Compute the firing angle required to control the motor at 1000 rpm at rated torque. iii. Compute the firing angle required to control the motor at -1000 rpm at rated torque.</p>	10 Marks	L3	C02
Or					
9.	a.	<p>A LEESON make Model M1125046, 90V, 7.6A, 1750 rpm DC shunt motor is used in a milling machine application. While machining the workpiece, it is required to rotate at a speed of 800 rpm in both directions at half-rated torque. The available power converters in the workshop are a single-phase semi-converter and a single-phase fully controlled rectifier, both fed with a 1-phase 230 V, 50 Hz supply.</p> <p>i. Chose the suitable converter for the application and justify it ii. Compute the firing angle to control the motor at 1000 rpm at half rated torque. iii. Compute the firing angle, to control the motor at -1000 rpm at half rated torque.</p>	10 Marks	L3	C02
	b.	Describe the performance equations of DC series motor and identify the suitable control parameters to vary the speed and torque of a DC Series motor.	10 Marks	L3	C02

