

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Industrial Drives and Application

Time: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. *M*: Marks, *L*: Bloom's level, *C*: Course outcomes.

Module – 1			M	L	C
Q.1	a.	With a neat diagram, state the essential parts of an electric drive system. Explain briefly.	10	L2	CO1
	b.	A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a which driven by a motor running at a speed of 1000 rpm. The moment of inertia of the motor and which are 0.5 and 0.3 kg-m ² respectively. Calculate the motor torque and equivalent moment of inertia referred to the motor shaft. In the absence of weight, motor develop a torque of 100 N-m, when running at 1000 rpm and efficiency of 100%.	10	L4	CO1
OR					
Q.2	a.	Explain the speed torque conventions and multi quadrant operation of motor driving a hoist load.	10	L2	CO1
	b.	A 6-pole, 50 Hz, 3 phase wound Rotor IM has a flywheel coupled to its shaft. The total moment of inertia of motor load flywheel is 1000 kg-m ² . Load torque is 1000 N-m of 10s duration flowed by a no load period which is long enough for the drive to reach its no load speed. Motor has a slip of 3% at a torque of 500 N-m. Calculate (i) Maximum torque developed by the motor. (ii) Speed at the end of Deceleration period. Assume motor speed torque curve to be a straight line in the operating range.	10	L4	CO1
Module – 2					
Q.3	a.	With a neat circuit and graph, explain the regenerative dynamic and plugging type of braking system for separately excited DC shunt motor.	12	L2	CO2
	b.	A 200 V, 10.5 A, 2000 rpm shunt motor has the armature and field resistance of 0.5 Ω, 400 Ω respectively. It drives a load whose torque is constant at rated motor torque. Calculate motor speed if the source voltage drops to 175 V.	8	L4	CO2
OR					
Q.4	a.	Explain the operation of single phase fully controlled rectifier control of separately excited DC motor.	12	L2	CO2
	b.	A 220 V, 970 rpm, 100 A dc separately excited motor has an armature resistance of 0.05 Ω. It is braked by plugging from an initial speed of 1000 rpm. Calculate : (i) Resistance to be placed in armature circuit to limit braking current to twice the full load value. (ii) Braking torque (iii) Torque when the speed has fallen to zero	8	L4	CO2

Module – 3

Q.5	a.	Explain the effect of unbalanced voltage and single phasing on the IM performance.	10	L2	CO3
	b.	Explain the plugging of 3 phase IM with speed torque characteristics.	10	L2	CO3

OR

Q.6	a.	Variable frequency control of IM is more efficient than stator voltage control, why?	10	L2	CO3
	b.	A 2200 V, 50 Hz, 3 phase, 6-pole Y-connected squirrel cage IM has the following parameters : $R_s = 0.075 \Omega$, $R_r = 0.12 \Omega$, $X_s = X'_r = 0.5 \Omega$. The combined inertia of motor and load is 100 kg-m^2 . Calculate time taken and energy dissipated in the motor during starting.	10	L4	CO3

Module – 4

Q.7	a.	With block diagrams, explain various schemes of voltage source inverter control of three phase IM drive.	10	L2	CO4
	b.	Explain the static Scherbius drive scheme of slip power recovery in Induction Motor.	10	L2	CO4

OR

Q.8	a.	Explain the operation of self controlled synchronous motor drive employing load commutated Thyristor inverter.	10	L2	CO4
	b.	A 500 kW, 3 phase, 3.3 KV, 50 Hz, 0.8 lagging power factor, 4 pole, star connected synchronous motor has following parameter : $X_s = 15 \Omega$, $R_s = 0$, rated field current is 10 A. Calculate : (i) Armature current and power factor at half the rated torque and rated field current. (ii) Field current to get unity power at the rated torques.	10	L4	CO4

Module – 5

Q.9	a.	What are the main features of stepper motors, which are responsible for its wide spread use. Also mention its advantages.	10	L2	CO5
	b.	With the help of block diagram, explain the closed loop variable speed drive employing sinusoidal PMAC motor fed from current regulated voltage source inverter.	10	L2	CO5

OR

Q.10	a.	Explain with diagrams, screw down operation in a rolling mill drive.	10	L2	CO5
	b.	With schematic, explain the wire section in paper mill drive and mention the types of motors, used in paper mill drive.	10	L2	CO5
