MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING
(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Model Question Paper

Fourth Semester BE Degree Examination

Electrical Drives and Control

Time: 3 Hours **Max. Marks: 100**

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

		Module -1	M	L	C
Q1	a.	With neat circuit diagram, input and output waveform , explain the different types of Power Electronics Converters	10	L2	CO1
	b.	Describe the voltage-current (V-I) characteristics of a MOSFET and explain how they determine its operation in different regions.	10	L2	CO1
		OR			
Q2	a.	With neat block diagram explain various components of electrical drive.	10	L2	CO1
	b.	Explain with neat diagram different types of electric drives.	10	L2	CO1
		Module- 2			
Q3	a.	Analyze the multi-quadrant operation of an electrical drive controlling a hoist load and calculate the power requirements during lifting, lowering, and braking operations in each quadrant	10	L3	CO2
	b.	Derive the fundamental torque equation for an electrical drive and apply it to calculate the torque required to drive a load under given speed and inertia conditions. A drive has following parameters : A drive has following parameters , J=10kg-m^2 ,T = 100-0.1N, Nm ,Passive load torque T_l= 0.05N ,N-m ,Where N is the speed in rpm. Initially the drive is operating in steady-state .Now it is to be reversed .For this motor characteristic is changed to T= -100-0.1N ,N-m .Calculate the time of reversal	10	L3	CO2
		OR			
Q4	a.	Demonstrate how a single-phase fully controlled rectifier can be used to control the speed of a DC separately excited motor, and calculate the firing angle for rated motor torque and 750 rpm for a 200V , 875 rpm , 150 A separately excited dc motor has an armature resistance of 0.06 Ω . It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V , 50 Hz assuming continuous conduction.	10	L3	CO2
	b.	Analyze the operation of a chopper-controlled separately excited DC motor and calculate duty ratio of chopper for motoring operation at rated torque and 350 rpm for a 230V ,960 rpm and 200A separately excited DC motor has an armature resistance of 0.02 Ω .The motor is fed from a chopper which provides both motoring and braking operation .The source has a voltage of 230V assuming conduction.	10	L3	CO2

Module - 3					
Q5	a.	Develop Microprocessor based control scheme for DC servomotor	10	L3	CO3
	b.	How would you analyze the relationship between the torque-speed characteristics and the phase voltage in a two-phase AC servo motor.	10	L3	CO3
OR					
Q6	a.	For a four – phase variable reluctance motor give the logic sequence for one – phase ON, two – phase ON , 1-2-1-2 – phase ON , three phase ON , 2-3-2-3 – phase ON modes.	10	L3	CO3
	b.	A stepper motor has a step angle of 1.8^0 . Find (a) resolution , (b) number of steps required for 50 revolutions (c) shaft speed if the stepping frequency is 5000 pulse/sec.	10	L3	CO3
Module - 4					
Q7	a.	Develop microprocessor based control scheme of BLDC motor	10	L3	CO4
	b.	A BLDC motor has a no load speed of 6000 rpm when connected to 120 V DC source .Armature resistance is 2.5Ω.Find the speed when it is supplied with 60 V and developing a torque of 0.5Nm.Neglect constant losses .The no- load current is 1A.	10	L3	CO4
Q8	a.	A 2.8kW,400V,50Hz ,4 Pole ,1370 rpm , delta connected squirrel – cage induction motor has following parameters referred to the stator:**Rs = 2Ω ,Rr' =5 Ω Xs =Xr' = 5Ω ,Xm = 80Ω**.Motor speed is controlled by stator voltage control. When driving a fan load it runs at rated speed at rated voltage.Calculate (i) motor terminal voltage ,current.	10	L3	CO4
	b.	How would you apply the principles of a voltage source inverter to design a control strategy for an induction motor drive.	10	L3	CO4
Module - 5					
Q9	a.	Implement a solar-powered pump drive system to ensure efficient water pumping under varying sunlight conditions.	10	L3	CO5
	b.	Develop DC drive with chopper control for Electric vehicle.	10	L3	CO5
Q10	a.	Implement Brushless DC motor drive for Servo- Applications .	10	L3	CO5
	b.	How would you apply a variable frequency drive to optimize the performance of an industrial motor in varying load conditions	10	L3	CO5

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