GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
ELECTRICAL DRIVES
EE701

TIME ALLOTTED: 3 HOURS   **FULL MARKS: 70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions

Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No.
1.	(i)	Slip of Induction motor at the time plugging is	1	CO2

a) s
b) 0
c) 1
d) 2-s

(ii) Short time rating of an electric machine — 1 — CO1
a) is equal to the name plate rating
b) is less than the name plate rating
c) is greater than the name plate rating
d) has no bearing to its name plate rating

(iii) A motor driving a passive load is said to be steady state stable if — 1 — CO1

a) $\dfrac{dT_L}{d\omega} - \dfrac{dT_M}{d\omega} = 0$

b) $\dfrac{dT_L}{d\omega} - \dfrac{dT_M}{d\omega} > 0$

c) $\dfrac{dT_L}{d\omega} - \dfrac{dT_M}{d\omega} < 0$

d) $\dfrac{dT_L}{d\omega} - \dfrac{dT_M}{d\omega} \neq 0$

(iv) In case of power failure, while a crane is in operation, the perfect electrical braking technique is — 01 — CO2
Regenerative
Dynamic
Counter current
Mechanical braking

(v) A variable frequency variable voltage induction motor — 01 — CO3
a) Can be accelerated at constant torque or constant current
b) Suffers from poor starting characteristics as in the case of mains fed motor
c) Has only steeped variation of speed
d) Suffers from stability considerations

(vi)	The line shaft drive also known as a) Individual Drive b) Group Drive c) Multi motor drive d) Load drive	01	CO1
(vii)	The consideration involved in the selection of the type of electric drive for the Load Variation application depends upon a) Constant Load b) Continuous Variable Load c) Pulsating Load d) All of the above	1	CO1
(viii)	The advantages of a group driver electric drive are a) High efficiency b) Low Noise c) Constant speed d) All of the above	1	CO2
(ix)	When quick speed reversal is a consideration, the motor preferred is a) synchronous motor b) squirrel cage induction motor c) wound rotor induction motor d) dc motor.	1	CO1
(x)	Duty cycle of a step-up chopper is	1	CO2

a) $\delta = \dfrac{T_{on} + T_{off}}{T_{off}}$

b) $\delta = \dfrac{T_{on}}{T}$

c) $\delta = \dfrac{T}{T_{on}}$

d) $\delta = \dfrac{T_{on}}{1 - T_{off}}$.

(xi)	A circuit used for Rheostat brake control mode of a DC chopper drive operates in a) Two Quadrant b) Three Quadrant c) One Quadrant d) Four Quadrant	01	CO2
(xii)	In voltage source inverters (VSIs), the amplitude of the output voltage is a) independent of the load b) dependent on the load c) dependent only on L loads d) none of the mentioned	1	CO3

GROUP – B
(Short Answer Type Questions)
Answer any *three* from the following: **3×5=15**

			Marks	CO No.
2.		Deduce the relation necessary to obtain the heating & cooling curve of an electric motor.	5	CO1
3.		Describe the operation of Dual Converter for Four Quadrant Operation.	5	CO1
4.		For variable frequency control of induction motor explain the following points For speeds below base speed, (V/f) ration is maintained constant, why ? For speeds above base speed, the terminal voltage is maintained constant, why ?	5	CO3
5.	(a)	What is regenerative braking?	2	CO2
	(b)	A 220V, 750 RPM, 200A separately excited dc motor has an armature resistance of 0.05 Ω. The armature is fed from a three phase non circulating current dual converter. If the forward converter operates at a firing angle of 70º. At what speed will the motor deliver rated torque.	3	CO2
6.		Obtain the equilibrium points and determine their stability when motor and load torques are $T = -1 - 2\omega$ and $T_L = -3\sqrt{\omega}$.	5	CO2

GROUP – C
(Long Answer Type Questions)
Answer any *three* from the following: **3×15=45**

			Marks	CO No.
7.	(a)	Describe four-quadrant operation of a motor driving a hoist load with the help of a labelled diagram showing directions of motor torque, load torque and motor speed, as applicable in each quadrant.	7	CO1
	(b)	Determine the equation of motion of the drive system consisting of a motor, a single gear train, an inertia torque, a hoist load, a dry friction load, a viscous friction load and a fan load as shown in Figure.	8	CO1

8.	(a)	Distinguish between CSI and VSI mode of operation.	5	CO2
	(b)	Write a short note on i) Solar and Battery Powered Drive ii) Stepper motor	10	CO3
9.	(a)	What are the reasons of load equalization in an electric drives?	3	CO1
	(b)	Find the equivalent drive parameters for rotational load	6	CO1

	(c)	A 3- phase, 50 kW, 8 pole, 960 rpm induction motor equipped with a flywheel is has a constant load torque of 300N-m for 10 sec and at wide intervals additional torque of 1500 N-m for 10 sec. Calculate the weight of flywheel used for load equalization, if the motor torque were not to exceed twice the rated torque and the gyration is 0.95m,(ii)The taken after removal of additional load before the motor torque becomes 700 N-m. Assume motor operates on that portion of the slip-torque characteristics, which is linear	6	CO3
10.	(a)	Derive the state space model of a DC motor.	5	CO2
	(b)	Derive an expression for armature current of separately excited DC motor fed by single phase full wave full controlled bridge rectifier with its wave form.	6	CO3
	(c)	Derive the heating and cooling characteristics of an electric motor.	4	CO2
11.		Write short notes on any three of the following:	5 ×3	
	(a)	Switched reluctance motor	5	CO2
	(b)	Application of DC and AC drives.	5	CO1
	(c)	Chopper fed DC drives	5	CO3
	(d)	Self-control of Synchronous motor	5	CO3
	(e)	Drive for paper mills	5	CO1