GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
ELECTRIC 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)	The heating time constant of an electrical machine gives an induction of its a) Cooling b) Rating c) Over-load Capacity d) Short-time Rating	1	CO1
	ii)	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
	iii)	The line shaft drive also known as a) Individual Drive b) Group Drive c) Multi motor drive d) Load drive	1	CO1
	iv)	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
	v)	A machine driving pulsed torque load is equipped with flywheel in order to a) Equalize the current demand during the operation b) Equalize the torque requirement c) Reduce the mechanical load d) Make the motor thermally suitable to drive the load	1	CO1
	vi)	Which type of drive can be used for Hoisting Machinery? a) AC slip Ring Motor b) Ward Leonard Method c) Cumulative Compound Motor d) All of the above	1	CO2

vii) A variable frequency variable voltage induction motor — 1 — C
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

viii) The energy loss during starting of a DC separately excited motor is — 1 — CO1
a) $Jw^2/2$
b) $Jw^2/4$
c) $3Jw^2/2$
d) Jw^2

ix) In chopper fed drive the speed is controlled by changing — 1 — CO2
a) the duty cycle
b) the firing angle
c) either (a) or (b) at a time
d) all of these

x) Which braking is not possible in series motor? — 1 — CO1
a) Regenerative braking.
b) Dynamic braking.
c) Counter electric current braking
d) Rheostat braking

xi) The slip s for plugging is — 1 — CO1
a) s-1
b) 2s-1
c) 2-s
d) 2+s

xii) In current source inverters (CSIs) — 1 — CO3
a) the amplitude of the output current is independent of the load
b) the amplitude of the output current dependents on the load
c) the amplitude of the output voltage is independent of the load
d) none of the mentioned

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

		Marks	CO No.
2.	Deduce an expression for the energy lost during starting of DC shunt motor with constant load torque T_L	5	CO3
3.	Explain V/F control of induction motor.	5	CO1
4.	Deduce the relation necessary to obtain the heating & cooling curve of an electric motor.	5	CO4
5.	A motor has the heating time constant of 60 min and cooling time constant of 90 min. When run continuously on full load of 20 kW, the final temperature rise is 40°C. If it is on an intermittent load of 10 min followed by 10 min shut down, what is the maximum value of load it can supply during the on-load period?	5	CO2
6.	Why VVVF method of speed control of a 3-phase induction motor is preferable to the frequency control method? Draw typical speed- torque curves for the both the methods	5	CO3

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

			Marks	CO No.
7.	a.	A 230V, 960rpm and 200A separately excited dc motor has an armature resistance of 0.02ohm. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assume continuous conduction and lossless chopper. i. Calculate duty ratio of chopper for motoring operation at rated torque and350rpm. ii. Calculate duty ration of the chopper for braking operation at rated torque and 350rpm.	10	CO4
	b.	Explain the Ward-Leonard method of speed control scheme of dc motor.	5	CO4
8.	a.	A motor driving a mining equipment has to supply a load rising uniformly from zero to a maximum of 1500 kW in 20 seconds during acceleration period, 1000kW for 50 seconds during the full load period and during acceleration period of 10 seconds when regenerative braking takes place, the kW returned to the mains falls from an initial value of 500 to zero uniformly. The interval for decking before the next load cycle starts is 20 seconds. Estimate a suitable kW rating of the motor, based on rms power.	10	CO1
	b.	Why equivalent current method is not applicable for speed dependent motors?	5	CO2
9.	a.	A 220v separately excited motor running at 1000 rpm draws 100A from the source. The motor is braked by plugging. Calculate (i) resistance to be inserted in the armature circuit to limit the breaking current to twice the full load current. i. Initial breaking torque ii. The breaking torque when speed has reduced to 500 rpm.	10	CO2
	b.	Describe the fundamental torque equation of electrical drive? Or define Dynamic torque?	5	CO1
10.		A 220V, A 220V, 980 rpm, 80A 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 2 times the full load value. ii. Braking torque iii. Torque when the speed has fallen to zero	15	CO3
11.	a.	Distinguish between CSI and VSI mode of operation.	5	CO2
	b.	Briefly describe: i) VSI Fed Induction Motor Drive ii) Chopper fed DC drives	10	CO3