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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Seventh Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; February - 2022

AC and DC Drives

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Explain the various types of electric drives speed torque characteristics, single phase converter fed dc drives with their operating characteristics to control their speed.

CO2: Describe the Three phase converter fed dc drives with their operating characteristics to control their speed and to analyze the various types of chopper fed drives to achieve different quadrant operation.

CO3: Describe the basic concepts & requirements of closed loop drives and to derive the closed loop transfer functions.

CO4: Explain and analyze the different methods of speed control used for Induction motor drives for variable speed applications analyze the braking operation of Induction motor.

CO5: Describe the principle operation of synchronous motor drives that are generally used and to describe and analyze the various stages of process involved in some manufacturing industries also analyze the types of motors used in various processes involved

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	List the parts of electric drives.	2	L3	CO1	PO1
b.	Explain dynamic braking of chopper control of DC series motor.	2	L2	CO2	PO2
c.	List the methods used for braking of induction motor.	2	L3	CO3	PO2
d.	Write the block diagram of closed loop position control.	2	L1	CO4	PO1
e.	Mention the four requirements of drives for paper mill.	2	L3	CO5	PO2
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	i) List and explain choice of electric drives. ii) Explain speed-torque characteristic of a DC series separately exited DC motor.	6 3	L3	CO1	PO1
b.	With neat circuit and waveforms, explain fully controlled rectifier under discontinuous mode of operation for separately exited DC motor.	9	L4	CO1	PO1
c.	A 200 V, 900 rpm, 140 A separately exited DC motor has an armature resistance of 0.04 Ω. It is fed from a 1-ϕ fully controlled rectifier with an AC source voltage of 220 V, 50 Hz. Assuming continuous conduction, calculate; i) Firing angle for rated motor torque and 700 rpm ii) Firing angle for rated motor torque and –450 rpm iii) Motor speed for α = 160° and rated torque	9	L3	CO1	PO2

Contd... 2

UNIT - II **18**

2 a.	With a neat diagram, elaborate the chopper control of a separately excited motor.	9	L3	CO2	PO2
b.	Explain multi quadrant operation of DC separately excited motor fed from fully controlled rectifier using dual convertor.	9	L4	CO2	PO2
c.	A 220 V, 1500 rpm, 50 A separately excited motor with armature resistance of 0.5 Ω is fed from a 3-ϕ fully controlled rectifier. Available AC source has a line voltage of 440 V, 50 Hz, AY-Δ connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero? i) Calculate transformer turns ratio ii) Determine firing angle when motor is running at 1150 rpm and rated torque iii) Determine firing angle, when motor is running at –900 rpm and twice the rated torque assume continuous conduction	9	L3	CO2	PO2

UNIT - III **18**

3 a.	A 220 V, 900 rpm, 110 A DC separately excited motor has an armature resistance of 0.04 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	9	L2	CO3	PO1
b.	With a neat diagram, explain the regenerative braking and dynamic braking of DC motor with necessary graph.	9	L2	CO3	PO1
c.	With a neat block diagram, explain the micro computer control of electric drive.	9	L4	CO3	PO2

UNIT - IV **18**

4 a.	With a block diagram representation, explain static Kramer drive.	9	L2	CO4	PO1
b.	Explain in detail with necessary circuit diagram and graphs voltage source inverter control of inducting motor drive.	9	L4	CO4	PO1
c.	Explain in detail closed loop speed control for VSI and cyclo converter induction motor drives.	9	L2	CO4	PO2

UNIT - V **18**

5 a.	With a block diagram / process flow, explain the textile mill. Also mention the drives used in each stages.	9	L4	CO5	PO1
b.	Explain reverse cold rolling mills process with block diagram and mention the requirement of drives used.	9	L4	CO5	PO1
c.	With a neat diagram explain self controlled synchronous employing load commuted inverter.	9	L2	CO5	PO2

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