Q. Code: 161041

Reg. No. | | | | | | | | | | | | | |

B.E./ B. TECH.DEGREE EXAMINATIONS, MAY 2024

Sixth Semester

EE18602 – ELECTRICAL DRIVES

(Electrical and Electronics Engineering)

(Regulation 2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Select the motor and its rating for an application.	4
CO 2	Analyze and design a converter for a DC drive.	4
CO 3	Model and design a controller for a DC drive.	4
CO 4	Understand the operation and control of induction and synchronous motor drive.	3
CO 5	Learn the distinctive features of traction schemes and choose and design a drive for different applications.	4

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Assess the role of interface between supply and electric motor in a drive.	**1**	**2**
2.	A motor with smaller rating can be selected for short term duty. Based on the given information, state the reason.	**1**	**3**
3.	Can semi converter fed DC drives operate in quadrant IV? Justify your Answer.	**2**	**3**
4.	Distinguish between CLC and TRC in chopper fed drives.	**2**	**3**
5.	What are the design procedures for closed loop speed control system?	**3**	**2**
6.	State the methods of speed sensing and compare.	**3**	**2**
7.	Identify the control method used in fan and pump drives. Also list out its drawbacks.	**4**	**2**
8.	Compare true synchronous mode and self-controlled synchronous mode.	**4**	**3**
9.	Mention the factors influencing the specific energy consumption of a train running at a given schedule speed.	**5**	**2**
10.	Three phase system could not become popular for traction purposes. Why?	**5**	**3**

PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Elaborate in detail, how you would determine the power rating of an electric motor when it is subjected to intermittent periodic duty load.	**(8)**	**1**	**3**
	(ii)	Explain in detail about various typical load torque characteristics.	**(6)**	**1**	**3**
		(OR)			
(b)	**(i)**	Analyze the multi quadrant dynamics of electrical drive in the speed-	**(8)**	**1**	**3**

torque plane with suitable example.

	(ii)	Analyze and derive the mathematical condition for achieving steady state stability of drive.	**(6)**	**1**	**3**
12. (a)		Develop an expression relating speed and torque of a separately excited DC drive fed from a single-phase converter with four controllable devices and explain its operation with necessary waveforms.	**(14)**	**2**	**3**
		(OR)			
(b)	**(i)**	220 Volt, 1500 rpm, 10 A separately excited DC motor has an armature resistance of 2 Ω. It is fed from a single phase fully controlled rectifier with an ac source of 230 Volt, 50Hz. Assuming continuous conduction, find the firing angle at (a) half the rated motor torque and 500 rpm,(b) rated motor torque and (-1000) rpm.	**(8)**	**2**	**3**
	(ii)	Select a suitable DC-DC converter circuit to analyze the multi-quadrant operation of a DC drive and explain with necessary mode diagrams.	**(6)**	**2**	**3**
13. (a)	**(i)**	Derive the transfer function of DC Motor load system with armature voltage control.	**(8)**	**3**	**3**
	(ii)	Analyze the closed loop speed control of DC motor with detailed block diagram.	**(6)**	**3**	**3**
		(OR)			
(b)		Design a speed controller with inner current controller for a separately excited dc motor drive system.	**(14)**	**3**	**3**
14. (a)		Illustrate V/f speed control scheme of a three-phase induction motor is similar to armature voltage control method of DC motor, List the ways to implement the voltage to frequency ratio.	**(14)**	**4**	**2**
		(OR)			
(b)	**(i)**	Compare and contrast the VSI and CSI fed induction motor drive.	**(6)**	**4**	**2**
	(ii)	Discuss in detail about the load commutated thyristor inverter fed synchronous motor drive.	**(8)**	**4**	**2**
15. (a)	**(i)**	Sketch and derive the relationship between principal quantities of	**(8)**	**5**	**4**

typical speed time curve for Main line service.

	(ii)	An Electric train has a schedule speed of 60 Km/h on a level track between two stops of 6 Km apart with duration of stop as 60 second. The value of acceleration and retardation are 2 Km/h/s and 3 Km/h/s respectively. Calculate the average speed and crest speed of the train. Assume trapezoidal speed/time curve.	**(6)**	**5**	**4**

(OR)

(b)	**(i)**	A train runs between two stations 1.6 km apart at an average speed of 36 km/h. If the maximum speed is to be limited to 70 km/h, acceleration to 2.5 km/h/s, coasting retardation to 0.018km/h/s and braking retardation to 3.2 km/h/s, compute the duration of acceleration, coasting and braking periods. Assume a simplified speed/time curve.	**(8)**	**5**	**4**
	(ii)	Briefly discuss the various types of electric braking used in traction?	**(6)**	**5**	**4**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.		List the process involved in making the paper from raw materials and analyze the drives used in each process.	**(10)**	**5**	**5**

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