Reg. No.												

Question Paper Code	11606

M.E. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

M.E. - Power Electronics and Drives

20PPEEL312 - MODERN POWER ELECTRONICS FOR TRACTION APPLICATIONS

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	List the typical elements of an electric drive.	*2,K1,CO1*
2.	Give example for active load torques and passive load torques.	*2,K1,CO1*
3.	Differentiate between continuous and discontinuous conduction modes.	*2,K2,CO2*
4.	Summarize the control strategies of chopper.	*2,K1,CO2*
5.	List the advantages of induction motor over DC motor.	*2,K1,CO3*
6.	Compare CSI fed drives and VSI fed drives.	*2,K2,CO3*
7.	State the features of electric traction.	*2,K1,CO4*
8.	Mention different methods of track electrification.	*2,K2,CO4*
9.	List the desirable characteristics of traction motors.	*2,K1,CO5*
10.	Brief about Metadyne control of traction motor.	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	(i) Explain the operation of electrical drives in three different modes.	*7,K2,CO1*
		(ii) Discuss and draw the speed-torque characteristics of various types of loads.	*6,K2,CO1*
		OR	
	b)	Summarize the factors governing the selection of electric drives for any particular application.	*13,K2,CO1*
12.	a)	Explain the steady state analysis of the single phase fully controlled converter fed separately excited DC motor drive for continuous current mode. Also explain its operation in motoring and regenerative braking mode.	*13,K2,CO2*
		OR	

b) (i) Describe about regenerative braking in dc series motor with chopper control. *7,K2,CO2*

(ii) Explain the operation of four quadrant dc chopper drive. *6,K2,CO2*

13. a) (i) Explain the stator voltage control scheme for speed control of three phase induction motor. *7,K2,CO3*

(ii) Power factor of the slip power recovery scheme of speed control of induction motor is low. Justify. *6,K2,CO3*

OR

b) Discuss in detail with suitable diagrams and waveforms of the v/f control technique of speed control method of Induction motor. *13,K2,CO3*

14. a) Discuss about tractive effort of a train and its function. Derive an expression for the tractive effort developed by train motion. Write the impact of train resistance in the mechanics of train motion. *13,K2,CO4*

OR

b) A 250 tonnes train with 10% rotational inertia effect is started with uniform acceleration and reaches a speed of 50 kmph in 25 seconds on level road. Calculate the specific energy consumption, if the journey is to be made according to trapezoidal speed-time curve. Acceleration = 2 kmphps; Tracking retardation = 3 kmphps; Distance between the stations = 2.4 km; efficiency = 0.9; Track resistance = 5 kg/tones. *13,K2,CO4*

15. a) Explain the different methods of traction motor control. *13,K2,CO5*

OR

b) Discuss the various types of electric braking used in traction in detail. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Explain the operation of voltage source inverter fed Induction motor drives. *15,K2,CO3*

OR

b) The distance between two stations is 1 km and the average speed of the train is 30 kmph. Station stopping time is 20 sec. Assume braking retardation 3 kmphps and maximum speed 1.25 times average speed. Calculate acceleration required to run the service if the speed time curve is approximated by a trapezoidal curve. *15,K2,CO4*