Code: 20EE4501A

III B.Tech - I Semester – Regular Examinations - DECEMBER 2022

UTILIZATION OF ELECTRICAL ENERGY
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours   Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level   CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	Identify the various factors that govern the choice of a motor for an electric drive.	L3	CO2	7 M
	b)	Analyze the type of drives do you suggest for paper mill and steel rolling mill with neat sketch.	L4	CO4	7 M
		OR			
2	a)	Distinguish the slip ring and squirrel cage induction motors from the application point of view.	L2	CO2	7 M
	b)	Explain about the different speed torque characteristics of different machines and give their utility in selection for Industrial loads.	L3	CO2	7 M
		UNIT-II			
3	a)	What is dielectric heating? How is this different from induction heating? Analyze the factors on which dielectric loss in a dielectric material depend.	L4	CO4	7 M

	b)	A slab of insulating material 150 cm^2 in area and 1 cm thick is to be heated by dielectric heating. The power required is 400 W at 30 MHz. Material has relative permittivity of 5 and p.f. of 0.5. Absolute permittivity is 8.854×10^{-12} F/m. Determine the necessary voltage.	L3	CO4	7 M
OR					
4	a)	Analyze the principle of arc welding and the difference between carbon and metallic arc welding and their relative merits.	L4	CO4	7 M
	b)	Classify the different types of electric heating and write the advantages of electric heating.	L3	CO2	7 M
UNIT-III					
5	a)	Analyze with a neat diagram the principle of operation of gas discharge lamps and its applications.	L4	CO4	7 M
	b)	State and discuss the laws of illumination with neat diagram.	L3	CO2	7 M
OR					
6	a)	Explain with a neat diagram, the principle of operation of a Mercury vapour lamp. Mention its use.	L4	CO4	7 M
	b)	A drawing hall measuring 30 m × 15 m × 5 m. is to be provided with illumination of 100 lux. Assuming a coefficient of utilization of 0.5 and depreciation factor of 0.8, determine the number of lamps required, their spacing, mounting height and total wattage. Luminous efficiency of lamps is 16.67 lumens/watt for 300 watt.	L4	CO4	7 M

UNIT-IV

7	a)	The distance between two stations is 1.92 Km. The schedule speed and the duration of the stops respectively are 40 Kmph. and 20 sec. Assume the quadrilateral approximation of the speed-time curve and coasting and braking retardation as 0.16 Kmphps and 3.2 Kmphps respectively. Determine the acceleration if the speed at the end of the accelerating period is 60.8 Kmph. Also determine the duration of the coasting period.	L3	CO5	7 M
	b)	Explain clearly regenerative braking when used for dc series traction motors. How does it differ from the regenerative braking and used for dc shunt motors?	L2	CO3	7 M

OR

8	a)	A train runs at an average speed of 50kmph between stations situated 2.5 km apart. Train accelerates at 3 kmph. Find its maximum speed assuming simplified trapezoidal speed time curve and also draw the speed time curve for the run.	L3	CO5	7 M
	b)	Draw and explain the speed-time curve for Trapezoidal and calculate the value of maximum speed.	L4	CO5	7 M

UNIT-V

9	a)	An electrical train weighting 400 tonnes moves up a gradient of 1% with the following speed time curve: i) Acceleration of 1.5 kmphps for 25 secs. ii) Constant speed for 40 secs. iii) Coasting for 30 secs. iv) Braking at 3 kmphps to rest.	L3	CO5	7 M

		Determine the specific energy consumption if tractive resistance is 50 N per tonne, rotational inertia 10%. Overall efficiency of the system 80%.			
	b)	Derive expression for (i) the tractive effort for propulsion of a train on level track (ii) the tractive effort for propulsion of a train up and down a gradient.	L4	CO5	7 M
OR					
10	a)	A goods train weighing 300 tonnes is to be hauled by a locomotive up a gradient of 2% with an acceleration of 1.0 kmphps, coefficient of adhesion 20%, track resistance 45 Newton/tone and effective rotating masses 10% of dead weight. If axle load is not to exceed 20 tonnes, determine the weight of locomotive and number of axles.	L3	CO5	7 M
	b)	Explain different types of current collectors for overhead system with a neat sketch.	L3	CO3	7 M