SREENIVASA INSTITUTE of TECHNOLOGY and MANAGEMENT STUDIES (autonomous)

UTILIZATION OF ELECTRICAL ENERGY

Question bank

III - B.TECH / II - SEMESTER   regulation: R20

Compiled by

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SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

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DEPARTMENT of ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK   **UTILIZATION OF ELECTRICAL ENERGY**

20EEE362C

III B.Tech / II Semester	L	T	P	C
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20EEE362C   UTILIZATION OF ELECTRICAL ENERGY

Pre-requisite: A course on power system engineering

COURSE EDUCATIONAL OBJECTIVES:

On successful completion of the course, students will be able to

1 Understand the principle, design of illumination systems and energy efficiency lamps.
2 Study the different methods of Electric heating and welding
3 Understand the electric traction systems and Electric Braking.
4 To study about the Calculations of tractive effort and Specific energy consumption.
5 To Study about the Power Factor Improvement and Economic Aspects in Utilizing Electrical energy

UNIT -1: ILLUMINATION   (9)

Introduction - Terms used in illumination -Laws of illumination - Polar curves - Photometry - Sources of light - Lamps: Incandescent lamps - Discharge lamps - SV and MV lamps - Lightingschemes- Requirement of good lighting scheme – Types and design of lighting schemes - calculation of illumination-Numerical problems.

Unit -2: Electric Heating and Welding   (9)

Electric Heating- Advantages and methods of electric heating - Resistance heating - Arc heating - Induction heating and dielectric heating - Infrared or radiant heating - power factor correction on utility.
Electric Welding- Electric Welding- Definition of welding - Welding process - Resistance and arc welding – electric welding equipment, comparison between AC and DC welding

UNIT -3: ELECTRIC TRACTION-I   (9)

Introduction- Systems of electric traction - Comparison between A.C. and D.C. traction - Specialfeatures of traction motor- Methods of electric braking- Rheostat braking and regenerative braking - Speed-time curves for different services – Trapezoidal and quadrilateral speed timecurves - Numerical problems.

UNIT -4: ELECTRIC TRACTION-II   (9)

Mechanics of train movement- Adhesive weight and coefficient of adhesion – Problems - Calculations of tractive effort - Power - Specific energy consumption - Factors affecting specificenergy consumption of an electric train operating on a given schedule - Control of traction motors.

UNIT -5: ECONOMIC ASPECTS OF UTILIZING ELECTRICAL ENERGY   (9)

Power Factor Improvement, Load Factor improvement, Off Peak Loads- Use of Exhaust Steam,Waste Heat recovery, Pit Head Generation, Diesel Plant, General Comparison of Private Plant and Public Supply- Initial Cost and Efficiency, Capitalization of Losses, Choice of Voltage.

TOTAL: 45 Hours

COURSE OUTCOMES:

	On successful completion of the course, students will be able to	Pos & PSOs
CO1	Acquire knowledge on Laws of illumination and Lighting schemes	PO1, PO2, PO3 & PSO1, PSO2
CO2	Identify most appropriate heating or welding techniques for suitable applications.	PO1, PO3, PO4 & PSO1
CO3	understand the concepts Electric traction systems and Electric braking	PO1, PO3, PO4 & PSO1
CO4	Analyze the Mechanics of train movement and Specific Energy Consumption	PO1, PO3, PO4 & PSO1
CO5	Understand the Economic Aspects of Utilizing Electrical energy	PO1, PO2, PO3 & PSO1, PSO2

TEXT BOOKS:

1. Shaw Taylor "Utilization of Electrical Energy", 1/e 2007, Open, Orient Longman-Hyderabad.
2. R K Rajput, Lakshmi Publications "Utilization of Electric power", 1/e 2006– NewDelhi.
3. S. L. Uppal, Khanna pulishers "Electrical Power", 1988.

REFERENCE BOOKS:

1. Utilization of Electric power and Electric traction, 10 /e 2009 J B Gupta, S Kkataria andsons Publications – New Delhi.
2. Utilization of Electrical Energy ,1/e 2010, Tarlok Singh, S. K. Kataria and Sons -NewDelhi.
3. Generation & Utilization of Electrical Energy, 1/e 2010, S. Sivanagaraju, M.Balasubba Reddy and D. Srilatha, Dorling Kindersly.Pvt Ltd – UP, INDIA.
4. Utilization of Electrical Power Including Electrical Power &Electric Traction ,1/e 1994, N. V. Suryanarayana, N e w Age Publications – New Delhi

REFERENCE WEBSITE LINK:

https://www.edx.org/search?q=POWER%20SYSTEMCO-PO

MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3		-	-	-	-	-	-	-	-	1	1
CO2	3	-	3	3	-	-	-	-	-	-	-	-	1	-
CO3	3	-	3	3	-	-	-	-	-	-	-	-	1	-
CO4	3	-	3	3	-	-	-	-	-	-	-	-	1	-
CO5	3	3	3		-	-	-	-	-	-	-	-	1	1
CO*	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**

	QUESTION BANK	
Question No.	**Questions**	**PO Attainment**
	UNIT – 1: ILLUMINATION	
	PART-A (Two Marks Questions)	
1	Define luminous flux , MHCP?	**PO1**
2	What is meant by candle power?	**PO1**
3	Define Utilization factor?	**PO1**
4	What are the laws of illumination?	**PO1**
5	What is meant by luminance?	**PO1**
6	What is polar curve?	**PO1**
7	Mention the types of lighting schemes?	**PO1**
8	What are the drawbacks of discharge lamps	**PO1**
9	What are the requirements of lighting system?	**PO1**
10	What are the characteristics of good illumination?	**PO1**
11	What do you mean by direct lighting?	**PO1**
12	What is Depreciation Factor?	**PO1**
13	What is Lumen?	**PO1**
14	What do you mean by brightness and its unit?	**PO1**
15	Which material is mostly used for the filament of incandescent lamps and why?	**PO1**
16	What are the factors to be considered in the design of a lighting scheme?	**PO1**
17	Name the various photometer heads.	**PO1**
18	List parts of incandescent lamp?	**PO1**
19	Define beam factor.	**PO1**
20	What is stroboscopic effect of fluorescent tubes?	**PO1**
	PART-B (Ten Marks Questions)	
1	Define (i) Luminous intensity (ii) luminous flux (iii) Lumen (iv) Illumination (v) Candle power	**PO1**
2	State the requirements of good lighting	**PO1**
3	List and explain the lamp fittings used in domestic and industrial applications	**PO1**
4	State and explain laws of illumination?	**PO1**
5	State and explain inverse square law of illumination	**PO1**
6	State and explain lambers cosine law of illumination	**PO1**
7	Define (i) Utilization factor (ii) depreciation factor (iii) Reflection factor (iv) Reduction factor (v) absorption factor.	**PO1**
8	State the advantages and disadvantages of direct & semi direct fitting.	**PO1**
9	A room 9m × 12m is illuminated by twelve 100 watt lamps. The luminous efficiency of the lamp is 30 lumens per watt and the co-efficient of utilization as 0.45. find the average illumination.	**PO1**
10	When a 250v lamp takes a current of a 0.8 ampere, it produces a total flux of 3,260 lumens calculate (i) M.S.C.P of the lamp ; and (b) efficiency of the lamp.	**PO1**

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Question No.	Questions	PO Attainment
UNIT – 2: RELAYS	
PART-A (Two Marks Questions)	
1	List various advantages of electric heating?	PO1
2	What are the properties of heating element?	PO1
3	State the materials employed for heating elements?	PO1
4	Classify the various types of electric heating?	PO1
5	List applications of direct resistance heating?	PO1
6	List applications of indirect resistance heating?	PO1
7	List applications of direct arc furnace?	PO1
8	List applications of indirect arc furnace?	PO1
9	What is induction heating?	PO1
10	State any 2 disadvantages of core type induction heating?	PO1
11	What is electric welding?	PO1
12	State the advantages of welding?	PO1
13	Classify the different types of electric welding?	PO1
14	What is resistance welding?	PO1
15	List the two applications of seam welding	PO1
16	Draw electric arc welding diagram?	PO1
17	List applications of simple butt welding?	PO1
18	Compare AC welding and DC welding?	PO1
19	State the disadvantages of welding?	PO1
20	List conditions for successful welding?	PO1
PART-B (Ten Marks Questions)	
1	Explain direct & in resistance heating?	PO1
2	Explain the construction and working of direct & indirect arc furnace with neat sketch?	PO1
3	Explain the construction and working of core type induction heating?	PO1
4	Explain the construction and working of Ajax Wyatt furnace ?	PO1
5	Explain the construction and working of coreless induction furnance ?	PO1
6	Explain Electric arc welding with a diagram?	PO1
7	Explain briefly the metal arc welding with a neat diagram?	PO1
8	Explain the sample butt welding with neat diagram?	PO1
9	Explain the spot welding with a neat sketch	PO1
10	Explain the seam welding giving the sequence operation?	PO1

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Question No.	Questions	PO Attainment
	UNIT – 3: ELECTRIC TRACTION – I	
	PART-A (Two Marks Questions)	
1	What is Electric traction ?	PO1
2	Write the advantages of Electric traction compare with Diesel locomotives?	
3	List types of traction system?	PO1
4	Compare A.C traction with D.C traction with necessary examples.	PO1
5	What are the special features of traction motors?	PO1
6	Classification of electric traction system?	PO1
7	Draw the speed-time curves for urban service.	PO1
8	Draw the speed-time curves for Suburban service.	PO1
9	Discuss the speed-time curves for main line services.	PO1
10	What is free running & braking period in speed time curve?	PO1
	PART-B (Ten Marks Questions)	
1	Explain about the different methods of electric braking systems in the case of traction. Discuss the characteristic features of a traction motor for effective tractionsystems	PO1, PO2
2	Explain about the different methods of electric braking systems in the case of traction.	PO1, PO2, PO4
3	b) A goods trains weighing 600 tonnes is to be hauled by a locomotive up a gradient of 2% with an acceleration of 2 kmphps. Coefficient of adhesion is 25%.Track resistance = 45 W/Ton and effect of rotational masses is 10% of dead weight. If axle load is not to exceed by 20 tonnes, determine the weight of locomotive and number of axles.	PO1, PO2, PO3,PO4
4	A train has schedule speed of 50 km/hr over a level track distance between stations being 2 km. Duration of stop is 20 sec. Assuming braking retardation of 5km/hr/sec and maximum speed 35% greater than average speed, calculate acceleration required to run the service.	PO1, PO2, PO4
5	Discuss the speed-time curves for urban service. How the electric traction system is classified? Briefly discuss.	PO1, PO2, PO4
6	A train is to run between two stations 1.6 km apart at an average speed of 40 kmph, the run is to be made to a quadrilateral N-T curve. Maximum speed is to be limited to 64 kmph, acceleration, to 2 kmphps, coasting retardation to 0.16, and braking retardation to 3.2, Determine the duration of a acceleration, coastingand braking periods.	PO1, PO2, PO4
7	Derive Trapezoidal and quadrilateral speed time curves.	PO1, PO2, PO3,PO4
8	Describe how Plugging, Rheostatic braking and Regenerative braking are employed with DC series motor	PO1,PO2
9	With the help of Speed-Time curve, define and explain the importance of following factors in a traction system. a) Notching period. b) Free running period. c) Coasting period.	PO1,PO2, PO4

	d) Braking period.	
10	An electric train is to have acceleration and breaking retardation of 0.8 km/hr/secand 3.2 km/hr/sec respectively. If the ratio of maximum to average speed is 1.3 and time for stop is 26 sec, find the schedule speed for a run of 1.5 km. Assume simplified trapezoidal speed time curve.	**PO1,PO2, PO4**

Question No.	Questions	PO Attainment
	UNIT – 4: ELECTRIC TRACTION - II	
	PART-A (Two Marks Questions)	
1	List factors affecting the specific energy consumption?	**PO1,PO2**
2	What is tractive effort?	**PO1**
3	Define coefficient of adhesion?	**PO1**
4	What is adhesive weight and coefficient of adhesion?	**PO1, PO2**
5	What is specific energy consumption?	**PO1, PO2**
6	Write the formula for tractive effort in terms of up and ground gradient?	**PO1, PO2**
7	What are the special features of traction motors?	**PO1, PO2**
8	Write any two comparisons between pure D.C and A.C systems?	**PO1, PO2**
9	What are the types of track electrification systems?	**PO1**
10	What are the advantages of steam engine?	**PO1**
	PART -B (Ten Marks Questions)	
1	Explain the calculations of tractive effort required for electric train	**PO1, PO2, PO4**
2	Write a short notes on specific energy consumption.	**PO1, PO2, PO4**
3	Derive tractive effort for propulsion of a train on level track?	**PO1, PO2, PO4**
4	What is tractive effort for propulsion of a train up and down a gradient?	**PO1, PO2, PO3,PO4**
5	A train weighing 300-ton accelerates uniformly from rest to a speed of 50 ph up a gradient of 1 in 100, the time taken being 20 s. The power is then cut off and train coasts down a uniform gradient of 1 in 1,000 for period30 s. When brakes are applied for period of 20 s so as to bring the train uniformly torest on this gradient Determine: 1. The maximum power output from the driving axles. The energy taken from the conductor rails in kW-hr assuming an efficiency of 75%.Assume tractive resistance to be 47 N/ton at all speeds and allow 15% for rotational inertia.	**PO1, PO2, PO4**
6	What is coefficient of adhesion? How the value of coefficient of adhesionaffects the slipping and skidding of the driving wheels of traction unit?	**PO1, PO2, PO4**
7	What is Mechanics of train movement?	**PO1, PO2, PO3**

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8	Derive specific energy consumption ?	**PO1, PO2, PO4**
9	List and Explain different controls of traction motors?	**PO1, PO2**
10	Explain Factors affecting specific energy consumption of an electric train operating on a given schedule?	**PO1, PO2, PO4**

Question No.	Questions	PO Attainment
UNIT – 5: ECONOMIC ASPECTS OF UTILIZING ELECTRICAL ENERGY	
	PART-A (Two Marks Questions)	
1	What is load factor?	**PO1**
2	Draw the heat recovery steam generators?	**PO1**
3	Explain (i) Gas Turbine (ii)Heat Recovery (iii) Power Grid	**PO1**
4	What is cooling water system?	**PO1**
5	What is Lubrication system?	**PO1**
	PART-B (Ten Marks Questions)	
1	Explain different power factor improvement methods?	**PO1**
2	Explain static capacitor method , synchronous condenser method?	**PO1**
3	Explain load factor improvement methods?	**PO1**
4	Explain the use of exhaust steam, waste heat recovery system?	**PO1**
5	Explain pit head generation ?	**PO1**
6	Draw the layout and explain Diesel power plant	**PO1**
7	Comparison between private plant and public supply	**PO1**
8	What are the capitalization of losses in utilizing electrical energy	**PO1**

ALL THE BEST