

# **SRM VALLIAMMAI ENGINEERING COLLEGE**

**(An Autonomous Institution)**

SRM Nagar, Kattankulathur – 603 203

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**QUESTION BANK**



**VIII SEMESTER**

**EE8015 – Electric Energy Generation, Utilization and Conservation**

**Regulation – 2017**

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**Even Semester**

*Prepared by*

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## UNIT I ILLUMINATION

**Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.**

### PART – A

Q.No	Questions	Course Outcome	BT Level	Competence
1	Define luminous efficiency	CO1	1	Remember
2	If the total lumens required are 7200 and coefficient of utilization is 0.3, calculate lamp lumens required	CO1	3	Apply
3	Generalize the types of lighting system.	CO1	6	Create
4	Examine illumination laws	CO1	3	Apply
5	Define luminous flux	CO1	1	Remember
6	Define the term lux.	CO1	1	Remember
7	Define lumen.	CO1	1	Remember
8	What are the properties of heating materials?	CO1	2	Understand
9	State the different types of electrical lamps used for illumination?	CO1	4	Analysis
10	Why tungsten is selected as the filament material?	CO1	5	Evaluate
11	Point out the various factors for designing the lightning scheme.	CO1	4	Analysis
12	Suggest suitable lamps for sports ground lighting application.	CO1	6	Create
13	What is flood lighting where is it generally used?	CO1	3	Apply
14	Explain the importance of street lighting system	CO1	4	Analysis
15	Describe the term MSCP and lamp efficiency.	CO1	1	Remember
16	Define solid angle	CO1	1	Remember
17	Generalize plane angle.	CO1	2	Understand
18	What do you understand by polar curves as applied to light source?	CO1	2	Understand
19	Deduce why sodium vapour lamps are not preferred for indoor lighting.	CO1	5	Evaluate
20	Discuss Stephan's law of radiation.	CO1	2	Understand
<b>PART-B</b>				
1	(i) Compare the output lumen of LED, CFL and Incandescent wattage. (7)	CO1	4	Analysis
	(ii) Discuss in detail about the street or road lighting with neat Sketches. (6)		1	Remember

2	<p>(i) Discuss laws of illumination and its limitations in actual practice. (6)</p> <p>(ii) A workshop dimension 30 metre * 20 metre is illuminated by 30 Nos. of 400 Watts Metal Halide lamps. The luminous efficacy of metal Halide lamp is 90 lumens/Watt. The depreciation factor is 1.2 and utilization factor is 0.6. Calculate the illumination level of the working plane. (7)</p>	CO1 CO1	2 4	Understand Analysis												
3	<p>A hall 30m long and 12m wide is to be illuminated and the illumination required is 50 lumens/m<sup>2</sup>. Deduce the number of fitting required, taking depreciation factor of 1.3 and utilization factor of 0.5. Given that the outputs of different types of lamp are given below:</p> <table border="0" data-bbox="277 716 803 800"> <tr> <td>Watts</td> <td>100</td> <td>200</td> <td>300</td> <td>500</td> <td>1000</td> </tr> <tr> <td>Lumens</td> <td>1625</td> <td>3650</td> <td>4720</td> <td>9970</td> <td>21520</td> </tr> </table> <p>(13)</p>	Watts	100	200	300	500	1000	Lumens	1625	3650	4720	9970	21520	CO1 CO1	5	Evaluate
Watts	100	200	300	500	1000											
Lumens	1625	3650	4720	9970	21520											
4	<p>(i) Describe and prove laws of illumination . (6)</p> <p>(ii) Design a street lighting of a road of 300metres long which is required to be illuminated by providing 40W fluorescent lamp. The width of the road is 4 m. Illumination is 0.6 lux. Assume efficiency of lamp as 70Lumen/watt. (7)</p>	CO1	2 4	Understand Analysis												
5	<p>Two street lamps are 20m apart and are fitted with a 500 C.P. lamp at a height of 8m above the ground each. Calculate the illumination at a point</p> <p>(a) Under the lamps each. (6)</p> <p>(b) Midway between the lamps (7)</p>	CO1	3	Apply												
6	<p>(i) List the various types of lamps commercially available. Also specify the energy efficient lamps for domestic and industrial lighting applications. (6)</p> <p>(ii) Discuss the various steps followed in calculation of illumination for designing the residential lighting. (7)</p>	CO1	1 2	Remember Understand												
7	<p>(i) Explain the various steps involved in designing of lighting system for a workplace. (7)</p> <p>(ii) Discuss about Diffusion principle of street lighting (6)</p>	CO1	1 1	Remember Remember												

8	Explain the various steps followed in calculation of illumination for designing the flood lighting in sports ground. (13)	CO1	4	Analysis
9	Point out the various factors to be taken into account for designing street lighting and flood lighting. (13)	CO1	4	Analysis
10	(i) Discuss the various steps followed in calculation of illumination for designing the residential lighting. (7)	CO1	3	Apply
	(ii) Show different types of indoor and outdoor lighting with neat sketches. (6)	CO1	4	Analysis
11	A drawing hall 30*15*5 m is to be provided with a general illumination of 120Lux. Taking coefficient of utilization as 0.5, depreciation factor as 1.4, Design the number of fluorescent tubes required, their spacing height, mounting height and total wattage. Take luminous efficiency of fluorescent tubes as 40 Lumen/Watt for 80watts tube. (13)	CO1	6	Create
12	(i) Explain the operation of fluorescent lamp. (6)	CO1	4	Analysis
	(ii) A classroom dimension 10 metre × 7.5 metre with a ceiling height of 4 metre is to be provided with general illumination of 300 lux. Considering a co-efficient of utilization is 0.5 and depreciation factor of 1.2. Calculate the number of 36 watts fluorescent lamps required. The luminous efficacy of 36 watts fluorescent lamp is 84 lumens per watt. (7)		2	Understand
13	Explain about the following lamps with neat diagrams. (i) Incandescent lamp (6) (ii) Sodium Vapour lamp (7)	CO1	1	Remember
14	(i) Explain the construction and working of mercury vapour lamp. (6)	CO1	4	Analysis
	(ii) A lamp of 500 c.p. is placed at the centre of a room 20*10*5 m. Calculate the illumination in each corner of the room. (7)		2	Understand
<b>PART-C</b>				
1	Determine the average illumination of a room measuring 9.15m by 12.2 m illuminated by halogen 150 watt Lamps . The luminous efficiency of lamps can be taken as 14 lumen/watt and coefficient of utilisation is 0.35. (15)	CO1	5	Evaluate
2	Explain about the following (i) Factory lighting (5) (ii) Flood lighting (5) (iii) Street lighting (5)	CO1	5	Evaluate

3	<p>In a photometric bench test balance is obtained when a standard lamp of 20 candela in the horizontal direction is 1.5m and the lamp being tested is 1.25m from the photometer screen (a) What is the luminous intensity of the test lamp (b)if the light from the test lamp is reduced by 15% ,What would be the respective distance of lamps from the screens? In this case the are fixed 3.5m apart and the screen moves between them.</p> <p style="text-align: right;">(15)</p>	CO1	5	Evaluate
4	<p>Illustrate about photometry and explain different types of photocell used photometry measurement and also describe about distribution photometry</p> <p style="text-align: right;">(15)</p>	CO1	6	Create



## UNIT II REFRIGERATION AND AIR CONDITIONING

**Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Variou types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.**

### PART – A

Q.No	Questions	Course Outcome	BT Level	Competence
1	List out the applications of refrigeration system	CO2	1	Remember
2	What ate the elements of refrigeration system	CO2	3	Apply
3	Define coefficient of performance	CO2	6	Create
4	List out classification of Air-conditioning system	CO2	3	Apply
5	What are the two main parts in domestic refrigeration system	CO2	1	Remember
6	Point out different types of water cooler	CO2	1	Remember
7	What is meant by refrigerant and list out classification	CO2	1	Remember
8	List out the desirable properties of ideal refrigerant	CO2	2	Understand
9	Define psychrometry	CO2	4	Analysis
10	What are the factors affecting comfort in air conditioning system	CO2	5	Evaluate
11	Differentiate Direct saving and pay back analysis	CO2	4	Analysis
12	What is meant by standard motor efficiency	CO2	6	Create
13	What is the necessity of energy efficient motors	CO2	3	Apply
14	Show the properties of energy efficient motors	CO2	4	Analysis
15	State the factors affecting motor efficiency	CO2	4	Analysis
16	What is meant by NEMA	CO2	1	Remember
17	Show what is meant by apparent efficiency	CO2	2	Understand
18	How energy-efficient motor different than a standard motor	CO2	6	Create
19	Evaluate the payback period for selecting energy efficient versus standard efficiency motors	CO2	5	Evaluate
20	Describe the efficiency of a energy efficient motor at different load points.	CO2	2	Understand

### PART-B

1	Explain with neat diagram construction and working of domestic refrigerator (13)	CO2	2	Understand
2	What is meant by water cooler and explain different types of water cooler with neat diagram (13)	CO2	3	Apply
3	Enlist the main requirement of good refrigerant and explain various types of refrigerant used for refrigeration system (13)	CO2	1	Remember
4	Explain with neat diagram different methods of refrigeration systems (13)	CO2	2	Understand
5	What are the components used for air-conditioning systems and briefly explain Air-conditioning cycle. (13)	CO2	4	Analysis
6	What is the working principle of Air-conditioning system and briefly explain classification of Air-conditioning systems (13)	CO2	1	Remember
7	Explain briefly load estimation of Air-conditioning system (13)	CO2	5	Evaluate
8	Explain briefly cost benefit analysis of Energy Efficient motors (13)	CO2	2	Understand
9	Explain briefly different losses occurred in the conventional motor components. (13)	CO2	4	Analysis
10	Explain detail steps to calculate annual energy saving for energy efficient motors over standard motors (13)	CO2	3	Apply
11	What is energy efficient motors and briefly explain motor efficiency labelling. (13)	CO2	5	Evaluate
12	Explain briefly energy efficiency of motors (13)	CO2	1	Remember
13	Explain briefly selection and application of energy efficient motors (13)	CO2	3	Apply

14	<p>A 75 Hp motor operating at 75 percent of full rated load determine kilowatts saved, energy saved,, Annual cost saving and cost effectiveness  Standard motor efficiency =91.6% ,  energy efficient motor efficiency=94,9%  Hours of operation=8000  Monthly demand charge=5.35\$/kW  Energy charge=0.03\$/kWh  List price premium=1189\$  Discount factor=0.75</p> <p>(13)</p>	CO2	3	Apply
<b>PART-C</b>				
1	<p>Explain briefly with diagram room type air conditioning system and list out advantages of the system</p> <p>(15)</p>	CO2	4	Analysis
2	<p>Explain briefly power factor and its effects of energy consumption</p> <p>(15)</p>	CO2	4	Analysis
3	<p>Explain briefly how energy efficient motors superior than standard motors with respect to electrical characteristics</p> <p>(15)</p>	CO2	5	Evaluate
4	<p>A 25-hp poly phase induction motor, 1800-rpm application with an average annual operating time of 4000 hr and a cost of electric power of 5 \$/kWh and standard motor efficiency 88% and energy efficient motor efficiency 93%, Typical list price of standard motor \$993 and typical list price of energy efficient motor \$1226.To find annual power cost saving and time to recover initial cost.</p> <p>(15)</p>	CO2	3	Apply

### UNIT III HEATING AND WELDING

**Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics**

#### PART – A

Q.No	Questions	Course Outcome	BT Level	Competence
1	List the factors which limit the choice of frequency in induction and dielectric heating.	CO3	1	Remember
2	Describe arc welding, also list its types?	CO3	1	Remember
3	State the requirements of a good heating material.	CO3	1	Remember
4	State the properties of a heating element used in indirect resistance heating	CO3	2	Understand
5	What is meant by arc welding and list its types?	CO3	2	Understand
6	Define resistance arc welding?	CO3	1	Remember
7	List few applications of dielectric heating.	CO3	1	Remember
8	Compare AC and DC sources as source of supply for arc welding.	CO3	6	Create
9	Point out advantages of electric heating.	CO3	4	Analyse
10	Compare DC welding and AC welding.	CO3	4	Analyse
11	Classify the methods of electric heating.	CO3	3	Apply
12	Show Stefan's law of heat radiation.	CO3	3	Apply
13	Summarize basic principle of induction heating and also its applications	CO3	5	Evaluate
14	Define LASER welding	CO3	1	Remember
15	Classify the modern welding techniques	CO3	3	Apply
16	Differentiate between core type and coreless type induction furnace.	CO3	4	Analyse
17	Define quenching.	CO3	2	Understand
18	Evaluate causes of failure of heating element.	CO3	5	Evaluate
19	Generalize on infra-red heating.	CO3	6	Create
20	Discuss any four advantage of coreless induction Furnace.	CO3	2	Understand

#### PART-B

1	(i) Draw a neat sketch of induction furnace and generalize its working. (6)	CO3	6	Create
	(ii) An insulating material 2cm thick and 150sq.cm. in area is to be heated by dielectric heating. The material has permittivity of 4 and PF as 0.04. Power requires is 400watts and frequency of 40MHz. Measure the voltage and current that will flow through the material. If the voltage were limited to 700 volts, what will the frequency to get the same loss? (7)		5	Evaluate
2	(i) Discuss the principle of arc welding and the difference between carbon and metal arc welding and their relative merits and demerits (7)	CO3	2	Understand
	(ii) Generalize the characteristics of a welding transformer. (6)		6	Create
3	Discuss in details about any two types of resistance welding. (13)	CO3	2	Understand
4	Calculate the efficiency of a high frequency induction furnace which takes 12 minutes to melt 1.3Kg of Aluminium. The input to the furnace being 4.5kW and the initial temperature is 15°C. Take specific heat of Aluminium is 880J/Kg/°C, melting point of Al is 660°C and latent heat of fusion of Al is 32KJ/Kg. (13)	CO3	3	Apply
5	Examine the induction heating? What are the characteristics of induction heating? Explain Ajex-wyatt furnace (13)	CO3	1	Remember
6	Analyse the efficiency of a high frequency induction furnace which takes 10 minutes to melt 1.815Kg of Aluminium. The input to the furnace being 5 kW and the initial temperature is 15°C. Take specific heat of Aluminium is 0.212 kcal/kg <sup>0</sup> c, melting point of Al is 660°C and latent heat of fusion of Al is 76.8 Kcal/Kg. (13)	CO3	4	Analyse
7	Explain the resistance heating methods with schematic diagrams. (13)	CO3	3	Apply
8	With neat diagram describe the different type of arc welding. (13)	CO3	1	Remember
9	(i) What are the types of heating? Explain about the induction heating. (6)	CO3	2	Understand
	(ii) What are the types of electric welding? Explain the Butt welding with neat diagram. (7)		5	Evaluate

10	(i) What are the types of ARC furnace? Describe the operation of them. (6)	CO3	1	Remember
	(ii) Describe the construction and working principle of dielectric heating. (7)		1	Remember
11	(i) Explain the working of coreless induction furnace and list its merits. (6)	CO3	1	Remember
	(ii) Calculate the time taken to melt 3 metric tones of steel in a three phase arc furnace having the following data: Current=5000A Arc voltage=60 V; Resistance of transformer=0.003Ω; Reactance of transformer=0.005 Ω; Melting point of steel = 1370° C ; Initial temperature of steel=18°C; Assume overall efficiency as 60%. (7)		4	Analyze
12	(i) Explain the various types of electric arc welding (6)	CO3	4	Analyze
	(ii) Explain the principle and working of welding transformer. (7)			
13	(i) A 15kW, 220V, single phase resistance over employs circular nickel-chromium wire for its heating element. The wire temperature is not to exceed 1230°C and the temperature of the charge to be 500°C. Calculate the size and length of the wire. Assume radiating efficiency=0.6, Emissivity=0.9, Specific resistance of nickel-chrome wire= $101.6 \times 10^{-6} \Omega \text{cm}$ . (7)	CO3	3	Apply
	(ii) With neat sketches, explain the functioning of carbon arc welding and shielded metal arc welding. (6)		4	Analyse
14	(i) A furnace consuming 5kW takes 15 minutes to just melt 2.5Kg of Aluminum, the initial temperature being 15°C. Find the efficiency of the furnace when the specific heat of Aluminium is 0.212cal/gm/°C, Melting point is 658°C and latent heat of fusion is 320J/gm. (7)	CO3	3	Apply
	(ii) What are the differences of AC welding and DC welding? (6)		2	Understand
<b>PART-C</b>				
1.	A piece of insulating material is to be heated by dielectric heating. The size is 10*10*3 cm. A frequency of 20MHz is used and power absorbed is 400 W. Calculate the voltage necessary for heating and current that flows in the material. The material has relative permittivity of 5 and p.f is 0.05. (15)	CO3	5	Evaluate

2.	A 10 KW single phase 200V resistance oven has a circular Nickle Chrome wire for its heating element .The final temperature is limited to 927 C and temperature of charge is to be 327 C. Determine the length and size of the wire required .Assume radiating efficiency 80%, Emissivity =0.9 and Specific resistance of Nickel chrome is $100 \times 10^{-6}$ ohm Cm. (15)	CO3	5	Evaluate
3.	Explain the process of dielectric heating and derive the expression for total heat energy. (15)	CO3	6	Create
4.	Briefly Explain about the process of fusion and non-fusion welding. (15)	CO3	4	Analyze



## UNIT IV TRACTION

**Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.**

### PART - A

Q.No	Questions	Course Outco	BT Level	Competence
1	Draw the speed torque characteristics of an ideal traction system drives	CO4	3	Apply
2	Analysis the features of electric traction,	CO4	4	Analysis
3	Explain type of motor is used for electric traction? Why.	CO4	6	Create
4	Summarize the factors affecting scheduled speed of a train.	CO4	2	Understand
5	Sketch the speed-time curve for a sub-urban railway system	CO4	3	Apply
6	Discuss the requirements of an ideal traction system.	CO4	2	Understand
7	Discuss the use of speed time curve?	CO4	2	Understand
8	List four advantages of AC series motor used as traction motor.	CO4	1	Remember
9	With respect to traction system, explain the term “free running”.	CO4	4	Analysis
10	Deduce the factor affecting schedule speed	CO4	5	Evaluate
11	What are the merits and demerits of D.C. system of track electrification.	CO4	6	Create
12	Mention different methods of track electrification	CO4	2	Understand
13	What are the factors affecting schedule speed in electric traction	CO4	3	Apply
14	What is meant by coefficient of adhesion	CO4	4	Analysis
15	What is meant by tractive effort	CO4	6	Create
16	List out the factors affecting specific energy consumption of an electric train operation on a given schedules	CO4	3	Apply
17	Differentiate dead, accelerating and adhesive weight	CO4	4	Analysis
18	Why are the ac single phase series motors not suitable for urban and sub urban service	CO4	1	Remember
19	What are the desirable requirements of braking in electric traction	CO4	4	Analysis
20	Define plugging	CO4	1	Remember

### PART-B

1	Describe the different methods of traction motor control and explain. (13)	CO4	2	Understand
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2	<p>(i) Describe the series- parallel control of electric traction motor. Also specify the advantages. (6)</p> <p>(ii) A train runs with an average speed of 50 kmph. Distance between stations is 4.5 km. Values of acceleration and retardation are 1.5 kmphs and 1.8 kmphs respectively. Calculate the maximum speed of the train assuming a trapezoidal speed time curve. (7)</p>	CO4	1  3	Remember  Apply
3	<p>(i) Explain the recent trends in electric traction systems. (6)</p> <p>(ii) A sub urban electric train has a maximum speed of 65kmph. The schedule speed including a station stop of 30seconds is 43.5kmph. If the acceleration is 1.3kmphs; Identify the value of retardation when the distance between stops is 3km. (7)</p>	CO4	4  1	Analysis  Remember
4	<p>(i) Explain about the types of supply system used in traction system. (6)</p> <p>(ii) A 250 tonnes train with 10% rotational inertia effect is started with uniform acceleration and reaches a speed of 50 kmphs 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 kmphs; Tracking retardation = 3 kmphs ; Distance between the stations = 2.4 km ; efficiency = 0.9; Track resistance = 5 kg/tones (7)</p>	CO4	4  3	Analysis  Apply
5	<p>(i) With the aid of transmission of tractive effort, describe the mechanism of train movement. (6)</p> <p>(ii) Describe clearly regenerative braking when used for Dc series traction motors. Also discuss the requirements for ideal traction. (7)</p>	CO4	1	Remember
6	<p>(i) A sub urban electric train has a maximum speed of 65kmph. The schedule speed including a station stop of 30seconds is 43.5kmph. If the acceleration is 1.3kmphs; Calculate the value of retardation when the distance between stops is 3km. (7)</p> <p>(ii) Discuss short notes on Trolley bus. (6)</p>	CO4	3  2	Apply  Understand
7	<p>(i) Draw the speed – Time curve of a traction system. Also explain various periods and the action. (6)</p> <p>(ii) A train has a scheduled speed of 50 kmph over a level track, distance between stations being 1.8 kms . Station stopping time is 30 seconds. Assuming braking retardation of 3 kmphs and maximum speed 50% greater than average speed. Estimate acceleration to run the service. (7)</p>	CO4	4  2	Analysis  Understand
8	<p>What are the various types of electric braking used in traction? Discuss any two types in detail. (13)</p>	CO4	2	Understand

9	<p>A train weighing 203 tonnes accelerates uniformly from the rest to a speed of 45kmph up a gradient of 1 in 500, the time taken being 30 seconds. The power is then cut off the coasts down as uniform gradient of 1 in 1000 for a period of 40 seconds when brakes are applied for period of 15 seconds so as to bring the train uniformly to the rest on this gradient. Estimate</p> <p>(i)The maximum power output from the driving axle.</p> <p>(ii)The energy taken from the conductor rails in Kwh. Assume efficiency is 60%, traction effort is 44 Newton/Tonne at all speed, rotational inertia is 10%. (13)</p>	CO4	5	Evaluate
10	<p>(i) Explain and compare the various arrangements of current collection in traction. (6)</p> <p>(ii) The maximum torque of a400v, three phase four pole 60c/s IM is 100NM at a slip of 0.1.If the motor works at 50c/s 400v supply.Evaluate the maximum torque, slip and the speed at which it occurs. Neglect stator impedance. (7)</p>	CO4	4 5	A Analysis Evaluate
11	<p>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 kmphs 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. (13)</p>	CO4	4	Analysis
12	<p>(i)Compare dc and ac systems of railway electrification from the point of main line and suburban line railway service (7)</p> <p>(ii)What is coefficient of adhesion? How does it affect slipping of driving wheels of the traction unit (6)</p>	CO4	3	Apply
13	<p>What is tractive effort of a train and what are its function? Derive an expression for the tractive effort developed by train motion? How does the train resistance play its part in the mechanics of train motion (13)</p>	CO4	4	Analysis
14	<p>(i)Derive crest speed using trapezoidal speed time curve for main line service (06)</p> <p>(ii)An electric train has an average speed of 42kmph on a level track between stops 1400 rpm apart, It is accelerated at 1.7 kmphs and is braked at 3.3 kmphs. Draw the speed-time curve for run (07)</p>	CO4	5 3	Evaluate apply
<b>PART-C</b>				

1	A train has schedule speed 60 Km/hr between stops which are 6 Kms apart .Determine the crest speed over the run, Assuming trapezoidal speed time curve. The train accelerates at 2 Km/hr/sec. The duration of stop is 60 seconds. (15)	CO4	5	Evaluate
2	A 210 tonne motor coach train has four motors each developing a shaft torque of 5150 N-M during the accelerating period, Calculate the time taken by a train to attain a speed of 40Km/hr, starting from rest on a gradient of 1 in 250 .The motors have the gear ratio of 3.5 to 1 and gear efficiency is 90 %.The wheel Diameter is100 cm. Assume train resistance has Newton per Tonne and allow 10% for the effect of rotational inertia. (15)	CO4	5	Evaluate
3	Define specific energy consumption and discuss the factors which affect the specific energy consumptions of trains operating at a given scheduled speed. (15)	CO4	5	Evaluate
4	(i) Explain briefly sag and tension calculation for trolley wire (7) (ii) A trolley wire of a tramway is suspended from two poles 40m apart ,If the tension applied is 500kg.Find also the total length of wire required (8)	CO4	4 3	Analysis Apply



**UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY**

**Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation**

**PART - A**

<b>Q.N o</b>	<b>Questions</b>	<b>Cours e</b>	<b>BT Level</b>	<b>Competen ce</b>
1	What are the different types of house wiring	CO5	4	Analysis
2	Generalise the advantages of conduit wiring	CO5	3	Apply
3	What is electric wiring	CO5	6	Create
4	How does the induction cooking work	CO5	3	Apply
5	What is the difference between induction and convention ovens	CO5	1	Remember
6	List out the advantages and disadvantages of induction cooktop	CO5	1	Remember
7	Point out the induction based appliances used in homes	CO5	1	Remember
8	Compare online and offline UPS	CO5	2	Understand
9	Illustrate the advantages of online UPS over offline UPS	CO5	4	Analysis
10	How does online UPS work	CO5	5	Evaluate
11	Which types of batteries normally used for UPS	CO5	4	Analysis
12	Show the main characteristics of UPS batteries	CO5	6	Create
13	Describe the power quality problems due to domestic loads	CO5	3	Apply
14	How can improve power quality in distribution system	CO5	4	Analysis
15	Why do non-linear loads cause harmonics	CO5	1	Remember
16	Write out the difference between linear and non linear loads	CO5	1	Remember
17	What are linear and non linear loads	CO5	2	Understand
18	Illustrate the purpose of earthing	CO5	2	Understand
19	List out the different methods of earthing	CO5	1	Remember
20	How Earthing system differ from grounding system	CO5	2	Understand

**PART - B**

1	Explain with neat diagram different types of the house wiring (13)	<b>CO5</b>	3	Apply
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2	A 230kV 3 phase 50Hz 200km transmission line has a capacitance to earth of $0.02\mu\text{F}/\text{km}$ per phase. Calculate the inductance and kVA rating of the Peterson coil used for earthing the above system (13)	CO5	5	Evaluate
3	Explain briefly with neat diagram working of Online & Offline uninterrupted power supply.	CO5	3	Apply
4	Compare briefly different types of house of wiring systems (13)	CO5	4	Analysis
5	Explain briefly different power quality problems due to home appliances (13)	CO5	2	Understand
6	Explain suitable methods to mitigate power quality issues in distribution system (13)	CO5	3	Apply
7	Explain with suitable example the effects of linear and non linear loads in power system. (13)	CO5	5	Evaluate
8	How power quality of power system affects due to non-linear loads and explain different methods to overcome the power quality issues (13)	CO5	6	create
9	Explain with with neat diagram different types of domestic earthing (13)	CO5	2	Understand
10	Explain briefly equipment and system grounding in substation (13)	CO5	5	Evaluate
11	Explain in detail different types of substation earthing (13)	CO5	3	Apply
12	What are the advantages of neutral grounding and explain briefly different methods of neutral grounding. (13)	CO5	4	Analysis
13	Explain briefly different types of batteries used for uninterrupted power supply (13)	CO5	4	Analysis
14	Explain in detail design criteria for substation grounding system (13)	CO5	5	Evaluate
<b>PART - C</b>				
1	Explain briefly how induction heating used for different domestic appliance and mention advantages of induction heating over conventional heating method (15)	CO5	4	Analysis
2	What is meant by Uninterrupted power supply and explain various uninterrupted power supply used for electrical appliance (15)	CO5	5	Evaluate

3	Narrate the design procedure of substation grounding system to limit the fault current (15)	CO5	3	Apply
4	Analyse about Soil Resistivity Measurement for grounding in substation (15)	CO5	4	Analysis

