INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

Department of Electrical and Electronics Engineering

ASSIGNMENT

Course Title	**UTILISATION OF ELECTRICAL ENERGY**
Course Code	**A70232**
Class	**IV B.Tech I Semester**
Branch	**Electrical and Electronics Engineering**
Year	**2018 - 2019**
Course Faculty	**Ms. Lekha Chandran, Assistant Professor**

OBJECTIVE:

This subject deals with power electronics equipments, different A.C and D.C machines speed control techniques

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT - 1 **ELECTRIC DRIVE**		
	Part - A (Short Answer Questions)		
1	What are different methods of modes of heat transfer?	Remember	1
2	State different types of drives and give three advantages and disadvantages of various drives.	Remember	1
3	Why electrical drives produces noise? How it is reduces?	Remember	1
4	What is load equalization? Why it is necessary? What are the speed control of?	Understand	1
5	Compare the slip ring and squirrel cage induction motors from the application.	Remember	1
6	Why and where is an individual drive recommended?	Remember	1
7	Discuss the various factors that groven the choice of a motor for a given.	Understand	1
8	Explain the starting characteristics of synchronous motor?	Remember	1
9	Explain the starting characteristics of D.C. motors?	Remember	1
10	Derive the equations of heat time curve and cool time curve?	Understand	1
11	State the criterions for selection of a motor.	Understand	1
12	Why is DC shunt motor preferred where precise speed control is needed?	Understand	1
13	What are advantages and disadvantages of group drive?	Remember	1
14	Explain speed torque characteristics of a DC shunt motor?	Understand	1
15	Explain speed torque characteristics of a DC series motor?	Understand	1
	Part - B (Long Answer Questions)		
1	Describe the selection of various types of motors for the following services i) Rolling mills ii)cranes and lifts iii)Textile machinery iv) Printing machine and v) Household applications.	Remember	1
2	Compare the characteristics of DC series and shunt motor. Explain the different types of drives?	Remember	1
3	a) Discuss advantages and disadvantages of electric drive over other drives and also explain different types of drives. b) Explain the various methods of speed control of AC motors.	Remember	1
4	What is an electric drive? What are its advantages? Compare a group drive and an	Understand	1

	individual drive.		
5	Explain what is mean by individual drivel and Group drivel discuss their relative merits and demerits?	Remember	1
6	Through a.c is superior to d.c for electric drives, sometimes d.c. is preferred. Give the reasons and mention some of the applications	Remember	1
7	Discuss how different parameters of speed-Time curve will vary with the type of train service	Understand	1
8	Explain what is mean by Load Equalization and how it is accomplished?	Remember	1
9	Discuss the various factors governing the choice of motors. Explain the various factors that affect the final temperature rise of a motor	Remember	1
10	Discuss the running characteristics of any two electric motors b) Discuss the selection criterion of a motor for a drive application.	Understand	1
10	By means of a block diagram explain the various components of a DC DRIVE.	Understand	1
11	By means of a block diagram explain the various components of an AC DRIVE	Understand	1
12	Decsribe the characteristics of mechanical loads	Remember	1
13	Explain why individual drive has super ceded group drive	Understand	1
14	Explain what is multi motor drive and why is it prevalent in modern industry	Understand	1
	UNIT - II **ELECTRIC HEATING AND WELDING**		
	Part - A (Short Answer Questions)		
1	What is high-frequency eddy current heating?	Remember	2
2	What is the Stefan's formula for heat dissipation?	Understand	2
3	a)What is pinch effect? b) What are the types of arc furnaces?	Remember	2
4	What are the various methods of controlling the temperature of resistance	Remember	2
5	The power required for dielectric heating of a slab of resin 150 cm^2 in area and 2-cm thick is 200 W, at a frequency of 30 MHz. The material has a relative permittivity of 5 and power factor 0.05. Find the voltage necessary and the current flowing through the material. If the voltage is limited to 700 V, what will be the frequency to obtain the same heating?	Understand	2
6	Why electric heating is preferred over other forms of heating?	Understand	2
7	What are the different methods of heat transfer under what conditions heat transfer by radiation is efficient?	Understand	2
8	What are different methods of electric heating ?	Remember	2
9	What are the various reasons of heating element failure?	Understand	2
10	What are the advantages of radiant heating	Understand	2
11	What are the advantages of radiant heating	Remember	2
12	Describe the selection of various types of motors for the following services. i) Rolling mills ii)cranes and lifts iii)Textile machinery iv) Printing machine and v) Household applications.	Understand	2
13	a) Discuss the various modes of heat dissipation b) Briefly explain the different methods of electric heating?	Remember	2
14	What is electric heating? What are the advantages over other methods of heating?	Remember	2
15	a) Explain the theory of dielectric heating and state its applications. What are the advantages of dielectric heating? b) Explain the principal of operation of induction heating and state and explain different type‘s induction heating methods?	Understand	2
	Part - B (Long Answer Questions)		
1	a) What are the various types of induction furnace? b) A high-frequency induction furnace that takes 20 min to melt 1.9 kg of aluminum, the input to the furnace being 3 kW, and the initial temperature is 25°C. Then, determine the efficiency of the furnace.	Remember	2
2	a)How will you control most efficiently the heat of resistance furnace? b) What advantages does graphite electrode process over carbon electrode?	Understand	2
3	A 4.5-kW, 200-V, and 1-φ resistance oven is to have nichrome wire heating elements. If the wire temperature is to be 1,000°C and that of the charge 500°C. Estimate the diameter and length of the wire. The resistivy of the nichrome alloy is 42.5 μΩ-m. Assume the radiating efficiency and the emissivity of the element as 1.0 and 0.9, respectively.	Understand	2

4	Explain in brief how heating is done in the following cases? i) Resistance heating, ii)Induction heating iii) Dielectric heating.	Understand	2
5	A 100-kW Ajax Wyatt furnace works at a secondary voltage of 12 V at power factor 0.6 when fully charged. If the reactance presented by the charge remains constant but the resistance varies invert as the charge depth in the furnace; calculate the charge depth that produces maximum heating effect when the furnace is fully charged.	Remember	2
6	What are the special applications of dielectric heating?	Understand	2
7	What are the advantages of dielectric heatings	Understand	2
8	What are the factors which limit the choice of high frequency in induction and dielectric heating	Remember	2
9	On what factors dielectric loss depends?	Understand	2
10	How high frequency supply frequency supply is obtained?	Remember	2
11	How high frequency supply frequency supply is obtained?	Remember	2
12	A20-kW, 230-V, and single-phase resistance oven employs nickel—chrome strip 25-mm thick is used, for its heating elements. If the wire temperature is not to exceed 1,200°C and the temperature of the charge is to be 700°C. Calculate the width and length of the wire. Assume the radiating efficiency as 0.6 and emissivity as 0.9. Determine also the temperature of the wire when the charge is cold	Understand	2
13	Six resistances, each of 60 ohms, are used in a resistance; how much power is drawn for the following connections. (a) Supply is 400 V, AC, and single phase and the connections are: i) Three groups in parallel, each of two resistance units in series. ii) Six groups are in parallel, each of one resistance unit. (b) With the same three-phase supply, they are connected in delta fashion. i) Two resistance units in parallel in each branch. ii) Two resistance units in series in each branch. (c) Supply is 400 V and three-phase while the connection is a star combination of: i) Two resistance elements in series in each phase. ii) Two resistance elements in parallel in each phase.	Understand	2
14	A 100-kW Ajax Wyatt furnace works at a secondary voltage of 12 V at power factor 0.6 when fully charged. If the reactance presented by the charge remains constant but the resistance varies invert as the charge depth in the furnace; calculate the charge depth that produces maximum heating effect when the furnace is fully charged.	Remember	2
15	Determine the amount of energy required to melt 2 ton of zinc in 1 hr, if it operates at an efficiency of 70% specific heat of zinc is equals to 0.1. The latent heat of zinc = 26.67 kcal/kg, the melting point is 480°C, and the initial temperature is 25°C.	Remember	2
UNIT - III ILLUMINATION			
Part - A (Short Answer Questions)			
1	What is photometry?	Remember	3
2	Define: (a) Mean spherical candle power,(b) Mean horizontal candle power(c)	Understand	3
3	Write short notes on Bunsen photometer head?	Understand	3
4	Write the expression that shows the relation between solid angle and plane?	Remember	3
5	What is the need of polar curves?	Understand	3
6	State at least four differences between Incandescent Lamp and Fluorescent.	Remember	3
7	State four advantages of graphite electrode over carbon electrode in case of arc.	Remember	3
8	State four advantages of graphite electrode over carbon electrode in case of arc heating furnace.	Understand	3
9	Write the principle of electric incandescent lamp?	Understand	3
10	Compare the merits and demerits of filament lamp and fluorescent lamps.	Remember	3
11	Compare the merits and demerits of filament lamp and fluorescent lamps.	Remember	3
12	Define the following :i)solid angle ii)candela iii)Luminous efficiency iv) M.S.C.P V) M.H.C.P?	Understand	3
13	Define the terms: i)Illumination ii) Glare iii)Luminance	Remember	3

	iv) Luminous efficiency.		
14	What are polar curves as applied to light sources/ show how these curves are sed for finding in MHCP and MSCP?	Remember	3
15	a) Explain why it is economical to use few large sources of light mounted high for industrial use than many sources of low output? b) What are drawbacks of direct lighting systems and how these are over come?	Remember	3
Part - B (Long Answer Questions)			
1	Two similar lamps having uniform intensity 500 CP in all directions below the horizontal are mounted at a height of 4 m. What must be the maximum spacing between the lamps so that the illumination on the ground midway between the lamps shall be at least one-half the illuminations directly under the lamps?	Understand	3
2	What do you understand by polar curves as applicable to light source Explain?	Remember	3
3	State the laws of illumination. Explain the laws with the help of suitable diagrams, and derive an equation of the same.	Remember	3
4	Define i) Luminous flux ii)Illumination iii) Luminance iv) Luminous intensity	Understand	3
5	Explain how the determination of mean horizontal luminous intensity and polar curve is made.	Understand	3
6	With a neat diagram, explain the construction and working of Mercury vapour lamp.	Remember	3
7	With the help of a neat diagram, explain the principal of operation of Incandescent lamp?	Remember	3
8	What are the various types of lighting schemes? Explain with a neat sketch?	Understand	3
9	Explain with connection diagram the operation of the low pressure fluorescent lamp and state its advantages?	Remember	3
10	Write short notes on: a) High pressure mercury vapour lamp i) M.A Type ii) M.T.Type b) Mercury fluorescent lamp	Remember	3
11	Write short notes on: a) High pressure mercury vapour lamp i) M.A Type ii) M.T.Type b) Mercury fluorescent lamp	Understand	3
12	A 200-V lamp takes a current of 1.2 A, it produces a total flux of 2,860 lumens. Calculate: 1. MSCP of the lamp and 2. Efficiency of the lamp	Remember	3
13	A room with an area of 6 × 9 m is illustrated by ten 80-W lamps. The luminous efficiency of the lamp is 80 lumens/W and the coefficient of utilization is 0.65. Find the average illumination	Remember	3
14	The luminous intensity of a lamp is 600 CP. Find the flux given out. Also find the flux in the hemisphere containing the source of light and zero above the horizontal	Understand	3
15	A surface inclined at an angle 40° to the rays is kept 6 m away from 150 candle power lamp. Find the average intensity of illumination on the surface.	Understand	3
16	Explain briefly the A.C motors used in traction.	Remember	3
UNIT - IV ELECTRIC TRACTION - 1			
Part - A (Short Answer Questions)			
1	Explain the methods of rheostatic bracking?	Understand	4
2	What are the requirements of good electric braking?	Remember	4
3	Briefly explain the A.C motors used in traction?	Remember	4
4	Explain why a DC series motor is ideally suited for traction purpose?	Understand	4
5	What are the advantages and disadvantages of track electrification?	Understand	4
6	What are the various traction systems you know of?	Remember	4
7	Discuss merits and demerits of steam engine drive?	Remember	4

8	What are various factors on which choice of traction system depends?	Understand	4
9	What are different systems of track electrification?	Remember	4
10	What is the advantage of flywheel drive?	Remember	4
11	What is the advantage of flywheel drive?	Understand	4
12	Discuss various factors which are taken into account while deciding the changeover from existing system of electrification to a new system of electrification.	Remember	4
13	a) What are the requirements of good electric braking? b) What are the various electric traction systems in India? Compare them.	Remember	4
14	Explain the different methods of the electric braking of the three-phase induction motor?	Understand	4
15	Describe how plugging, rheostat braking, and regenerative braking are employed with DC series motor.	Understand	4
Part - B (Long Answer Questions)			
1	Why DC series motor is ideally suited for traction services? Review the existing electric traction systems in India.	Understand	4
2	Derive expression for: a) The tractive effort for propulsion of train on level track. b) The tractive effort for propulsion of train up and down a gradient	Remember	4
3	a) What is electric traction? b) Mention a few advantages of electric traction c) What are the disadvantages of electric braking? d) What are the advantages of self-contained locomotives?	Remember	4
4	State the condition under which regenerative bracking with d.c series motor is possible and explain with the help of circuit diagram. Also explain the various methods of providing regeneration	Understand	4
5	Explain the following electric bracking methods. i) Plugging ii) Rheostatic bracking iii) Regenerative bracking.	Understand	4
6	What are the characteristics that a traction motorb should possess?	Remember	4
7	What are the dis advantages of a bow collector?	Remember	4
8	What are the different current collection gears?	Understand	4
9	What precautions are taken in connection with location of neutral section?	Remember	4
10	What are advantages of weight tensioning/	Remember	4
11	What are advantages of weight tensioning/	Understand	4
12	A 230-V DC shunt motor takes a current of 20 A on a certain load. The armature resistance is 0.8 Ω and the field circuit resistance is 250 Ω. Find the resistance to be inserted in series with the armature to have the speed is half if the load torque is constant.	Remember	4
13	A series motor having a resistance of 0.8 Ω between its terminal drives. The torque of a fan is proportional to the square of the speed. At 220 V, its speed is 350 rpm and takes 12 A. The speed of the fan is to be raised to 400 rpm by supply voltage control. Estimate the supply voltage required	Remember	4
14	A 230-V, 10-HP, and DC shunt motor with R_a = 0.2 Ω and R_{sh} = 80 Ω, runs at 1000 rpm on full load. The efficiency on the full load is 80%. If the speed is to be raised to 1200 rpm keeping load constant, determine extra resistance to be added in the field ckt. Assume 1 HP = 736 W	Understand	4
15	Two DC traction motors, each takes a current of 45 from 450 V mains and runs at the speed of 600 and 625 rpm, respectively. Each motor has an effective resistance of 0.4 Ω. Calculate the speed and voltage across each machine when mechanically coupled and electrically connected in series and taking a current of 45 A from 450 V mains the resistance of each motor being unchanged	Understand	4
UNIT - V ELECTRIC TRACTION - 2			
Part - A (Short Answer Questions)			
1	With the help of trapezoidal speed-time curve, derive an expression for the maximum speed and hence estimate the values of acceleration and retardation.	Understand	5

2	Derive the expressions for the speed-Torque characteristics of dc shunt motor under the following conditions: a) Without control b) External resistance in the armature circuit c) External resistance in the field circuit d) Armature shunted with resistance R Draw the typical characteristics for all the conditions	Remember	5
3	Derive an expression for specific energy output on level track using a simplified speed–time curve.	Remember	5
4	Derive the relationship between acceleration, retardation, maximum speed, running time and distance between two stops assuming a trapezoidal Speed- Time curve.	Understand	5
5	What are the different methods of approximation of speed-Time curves? Derive expression for distance travelled using quadrilateral approximation method of V (t) curve	Understand	5
6	What steps are taken to reduce the interference in the telecommunication circuits?	Remember	5
7	Compare Ac and DC systems of traction?	Remember	5
8	What types of train services railways have to cater for and what are their distinguishing features?	Understand	5
9	What are the factors affecting the schedule speed of a train?	Remember	5
10	What are the different types of functions performed by the tractive effort developed by traction unit?	Remember	5
11	What are the different types of functions performed by the tractive effort developed by traction unit?	Understand	5
12	With the help of a complete Speed-Time curve, discuss how different parameters. Of this curve change with the type of train service.	Remember	5
13	Derive an expression for the distance traveled by an electric train using trapezoidal speed-time curve.	Remember	5
14	Draw the speed-time curves for different services and explain them in detail.	Understand	5
15	Assuming a quadrilateral speed-time curve, develop a method of determining the specific energy consumption of a train.	Remember	5
	Part - B (Long Answer Questions)		
1	With the help of trapezoidal speed-time curve, derive an expression for the maximum speed and hence estimate the values of acceleration and retardation	Understand	5
2	Derive the expressions for the speed-Torque characteristics of dc shunt motor under the following conditions: a) Without control b) External resistance in the armature circuit c) External resistance in the field circuit d) Armature shunted with resistance R Draw the typical characteristics for all the conditions.	Remember	5
3	Derive an expression for specific energy output on level track using a simplified speed–time curve.	Remember	5
4	Derive the relationship between acceleration, retardation, maximum speed, running time and distance between two stops assuming a trapezoidal Speed- Time curve.	Understand	5
5	What are the different methods of approximation of speed-Time curves? Derive expression for distance travelled using quadrilateral approximation method of V (t) curve.	Understand	5
6	What are the major equipments of a DC substation?	Remember	5
7	What are the different systems of current collection and give their merits and demerits?	Remember	5
8	What are the advantages of automatic weight tensioning and temperature compensation arrangements in the OHE?	Understand	5
9	What are the advantages and disadvantages of linear induction motor?	Remember	5
10	What is the function of a motor starter?	Remember	5
11	What is the function of a motor starter?	Understand	5
12	The distance between two stops is 1.2 km. A schedule speed of 40 kmph is required to cover that distance. The stop is of 18-s duration. The values of the acceleration and retardation are 2 kmphp and 3 kmphp, respectively. Then, determine the maximum speed over the run. Assume a simplified trapezoidal speed–time curve.	Remember	5

13	The speed–time curve of train carries of the following parameters: 1. Free running for 12 min. 2. Uniform acceleration of 6.5 kmphp for 20 s. 3. Uniform deceleration of 6.5 kmphp to stop the train. 4. A stop of 7 min. Then, determine the distance between two stations, the average, and the schedule speeds	Remember	5
14	The distance between two stops is 5 km. A train has schedule speed of 50 kmph. The train accelerates at 2.5 kmphps and retards 3.5 kmphps and the duration of stop is 55 s. Determine the crest speed over the run assuming trapezoidal speed–time curve.	Understand	5
15	An electric train has an average speed of 40 kmph on a level track between stops 1,500 m apart. It is accelerated at 2 kmphps and is braked at 3kmphps. Draw the speed–time curve for the run.	Remember	5

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