Question Bank

Unit 1

Heating and Welding:

1. Explain the principle of dielectric heating and derive an expression for the heat produced in a di electric heating. **(June /July 2014)**
2. Explain high frequency eddy current heating and applications of eddy current heating. **(June /July 2014)**
3. A piece of insulating material is to be heated by an electric di heating. Size of the piece is 12*12*3cm.A frequency of 20 Mhz is used and the power absorbed is450W.If the material has Er =5 and the power factor of 0.05, calculate the voltage necessary for heating and current that flows in the material .if the voltageis limited to 1700 V, what will be the frequency to get the same loss? **(June /July 2014)**
4. With a neat diagram, explain the working of direct arc furnace. Mention its application **(Dec2013/Jan 2014)**
5. With a neat diagram, Explain butt welding and mention its uses. **(Dec2013/Jan 2014)**
6. A cubic water tank has surface area of 96 m2 and is filled to 90% capacity 2 times daily. The water is heated from 20°C to 70°C. The losses per square metre of tank surface per 1°C temperature difference are 16 W. Find the loading in kW and the efficiency of the tank. Assume specific heat of water = 4,200 J/kg/°C . **(Dec2013/Jan 2014)**
7. What are the different modes of heat transfer? Discuss in brief. **(June /July 2013)**
8. List the requirements of good heating element. **(June /July 2013)**
9. A resistance oven employing nichrome wire is to be operated from 220 V single-phase supply and is to be rated at 16 kW. If the temperature of the element is to be limited to 1,170°C and average temperature of the charge is 500°C, find the diameter and length of the element wire. Radiating efficiency = 0.57, Emissivity=0.9, Specific resistance of nichrome = (109 ×10–8) ohm-m. **(June /July 2013)**
10. Give a classification of different electric heating methods and explain them briefly. **(Dec2012/Jan 2013)**

11. Determine the efficiency of a high-frequency induction furnace which takes 10 minutes to melt 2 kg of a aluminium initially at a temperature of 20°C. The power drawn by the furnace is 5 kW, specific heat of aluminium = 0.212, melting point of aluminium = 660° C and latent heat of fusion of aluminium. = 77 kcal/kg. **(Dec2012/Jan 2013)**

Unit 2

Elecrolytic process:

1. State and explain Faraday's laws of electrolysis.**(June /July 2014), (Dec2013/Jan 2014)**

2. What is electro deposition / explain the factors influences the quality of electro deposition.
(June /July 2014), (Dec2013/Jan 2014), (June /July 2013)

3.Define:

i. current Efficiency

ii. Energy efficiency. **(June /July 2013) (Dec2012/Jan 2013)**

4. A rectangular plate 20*10 cm is to be created with Nickel with a layer of 0.2mm thickness,

Determine the quantity of electricity in Amp-hr and time taken for the process, assume

Current Density=190 Amp/M2,

Current efficiency-90%,

Special gravity of Ni=8.9 grms?cc,ECE of Ni=0.0003043 **(June /July 2013)**

5. Explain the processes:

i.Extraction of metals.

ii.Anodizing. **(Dec2012/Jan 2013)**

6.Nickel coating of 1mm thickness is to be built on a cylindrical surface 15 cms diameter and 20 cm long in 1.5 hours. Calculate the electrical energy needed if ECE of nickel is 0.3043 mgm/coulomb.specific gravity 8.9 and voltage used in electroplating is 10 volts.

(Dec2012/Jan 2013)

Unit 3&4

Illumination Engineering:

1. State and explain two laws of illumination. **(June /July 2014), (Dec2013/Jan 2014)**

2. With a neat Sketch, explain the working principle and constructional details of a fluorescent tube light. **(June /July 2014), (Dec2013/Jan 2014)**

3. An incandescent lamp has suspended from the ceiling of a room. The illumination below the lamp vertically downwards is 80 lux. When the illumination is measured at a distance of 2m from the ceiling, its value is 40 lux. Find the candle power of the lamp and its vertical distance from the floor. **(June /July 2014)**

4. Define the following terms:

   i) solid angle, ii) MHCP iii) MSCP **(Dec2013/Jan 2014)**

5. What are the factors, which have to be taken into consideration for design of the lighting scheme? Explain two of them in detail. **(Dec2013/Jan 2014), (Dec2012/Jan 2013)**

6. Two lamps A and B of 200 candela and 400 candela respectively are situated 100 m apart. The height of A above the ground level is 10 m and that of B is 20 m. If a photometer is placed at the centre of the line joining the two lamp posts, calculate its reading.

   (Dec2013/Jan 2014) (Dec2012/Jan 2013)

7. Define:

   i) Luminous Efficiency, ii)Depreciation factor, iii) coefficient of utilisation

   iv) Space –Ht ratio. **(June /July 2013)**

8. The illumination in a drawing office 30 m × 10 m is to have a value of 250 lux and is to be provided by a number of 300-W filament lamps. If the coefficient of utilization is 0.4 and the depreciation factor 0.9, determine the number of lamps required. The luminous efficiency of each lamp is 14 lm/W. **(June /July 2013)**

9. A directly beneath the source. How far is B from A if the illumination at B is only 1/10 as great as at A? Let the intensity of the lamp be I and the distance between A and B be x metres as shown in Illumination at point A, EA = I/102 = I/100 lux Illumination at point B. **(Dec2012/Jan 2013)**

Unit 5,6&7

Electric Traction

1. What is electric traction system? What are the requirements of an ideal traction system?

(June /July 2014)

2. Define Crest speed, average speed and schedule speed Derive the expression for speed and total distance of run, for a simplified speed time curve of a main line service.

(June /July 2014) , **(Dec2013/Jan 2014), (June /July 2013), (Dec2012/Jan 2013)**

3. An electric train is to have acceleration and braking retardation of 1.2 km/ hour/sec and 4.8 km/hour/sec respectively. If the ratio of maximum to average speed is 1.6 and time for stops 35 seconds, find schedule speed for a run of 3 km. Assume simplified trapezoidal speed time curve.

(June /July 2014)

4. Define Specific energy output and specific energy consumption of the train, Derive the expression of specific energy output using simplified speed time curve.

(June /July 2014), (June /July 2013), (Dec2012/Jan 2013)

5. An electric locomotive weighing 100 tonne can just accelerate a train of 500 tonne (trailing weight) with an acceleration of 1 km/h/s on an up-gradient of 0.1%. Train resistance is 45 N/t and rotational inertia is 10%. If this locomotive is helped by another locomotive of weight 120 tonne, find : (i) the trailing weight that can now be hauled up the same gradient under the same conditions. (ii) the maximum gradient, if the trailing hauled load remains unchanged. Assume adhesive weight expressed as percentage of total dead weight as 0.8 for both locomotives.

(June /July 2014)

6. What is regenerative braking system? Derive the expression for energy returned during regeneration. **(June /July 2014), (Dec2013/Jan 2014)**

7. What are the advantages and disadvantages of regenerative braking? **(June /July 2014)**

8. A 2340-tonne electric train including locomotives runs up an ascending gradient of 1 in 80 for 5 minutes, with the following speed/time curves: uniform acceleration of 1.6 km/h/s for 25 seconds 2. constant speed for 50 seconds 3. coasting for 30 seconds. braking at 2.56 km/h/s to

rest.Compute the specific energy consumption if train resistance is 50 N/t, effect of rotational inertia 70%, overall efficiency of transmission gear and motor, 75%. **(June /July 2014)**

9. Mention the advantages and limitations of electric drives. **(Dec2013/Jan 2014)**

10. A train runs between two stations 1.6 km apart at an average speed of 36 km/h. If the maximum speed is to be limited to 72 km/h, acceleration to 2.7 km/h/s, coasting retardation to 0.18 km/h/s and braking retardation to 3.2 km/h/s, compute the duration of acceleration, coasting and braking periods. Assume a simplified speed/time curve. **(Dec2013/Jan 2014)**

11. Define Tractive effort.Derive an expression for tractive effort of train considering its movement on an upward gradient and having track resistance. **(Dec2013/Jan 2014), (June /July 2013)**

12.Explain i) Shunt transition, ii) Bridge transition applied to series parallel starting of D.C. motors with neat figures. **(Dec2013/Jan 2014), (June /July 2013), (Dec2012/Jan 2013)**

13. Explain the concept of energy saving by series parallel control. **(June /July 2013)**

14. Write briefly on train lighting system. **(June /July 2013), (Dec2012/Jan 2013)**

15. With a neat figure, explain the construction and working of a single phase AC series motor. **(Dec2012/Jan 2013)**

16. A 250-tonne motor coach having 4 motors, each developing a torque of 8000 N-m during Acceleration, starts from rest. If up-gradient is 30 in 1000, gear ratio 3.5, gear transmission efficiency 90%, wheel diameter 90 cm, train resistance 50 N/t, rotational inertia effect 10%, compute the time taken by the coach to attain a speed of 80 km/h. If supply voltage is 3000 V and motor efficiency 85%, calculate the current taken during the acceleration period.

(Dec2012/Jan 2013)

Unit 8

Introduction to Electric and Hybrid Vehicles

1. Explain the construction and working principle of a linear induction motor. **(June /July 2014)**

2. What is hybrid vehicle? Explain configuration and performance of hybrid vehicle.

` **(June /July 2014)**

3. Write a note on tramways and trolley buses. **(June /July 2014)**

4. Compare electric vehicles over conventional internal combustion engine vehicles.

(June /July 2014)

5. With a block diagram ,explain the functions of different subsystems in an electric vehicle.

(Dec2012/Jan 2013)