7E4174

Roll No. :

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B.Tech. (Sem. VII) (Main) Examination, January - 2010
Electrical Engineering
(7EE4 Utilization of Electrical Power)

Time : 3 Hours] [Total Marks : 80

[Min. Passing Marks : 24

Attempt overall five questions. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.)

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. Nil 2. Nil

1 (a) **Discuss advantages and disadvantages of Electric heating over conventional methods. Derive the condition for maximum power output of electric arc furnace and obtain the power factor for such condition.** 8

(b) **What are the requirements of good heating elements? Discuss the causes of its failures.** 8

OR

1 (a) **Explain the principle of 'dielectric heating'. 'Derive the mathematical expression of power consumed in such process. State important applications of dielectric heating.** 8

(b) **Explain various types of electric welding. Explain seam welding in detail.** 8

2 (a) Define .

(i) plane angle and solid angle

(ii) depreciation factor.

(iii) cosine inverse law
(iv) polar curve

8

(b) Two lamps of 500 W, each with lamp efficiency of 25 lumens per watt are mounted on two lamp post 10 m apart. The posts have different heights of 3 m and 4 m respectively. Calculate the illumination at a point mid way between the lamp posts.

8

OR

2 (a) With respect to illumination, discuss stroboscopic effect and state its remedies. Also explain sodium vapour lamp in detail.

8

(b) Compare flourescent lamp. CFL and filament lamps on the basis of light, capital and running cost, efficiency.

8

3 (a) State and explain Faraday's laws of electrolysis. What factors govern the rate of electro-deposition process?

8

(b) A rectangular metal plate having 5cm × 4cm × 1cm as its dimensions is to be electroplated with nickel. How long it will take to deposit a layer of 0.1 mm thickness, when a current of 4.3 Amp flows through the circuit? E.C.E. of nickel = 0.000304 gm/coloumb and density of nickel = 8.6 gm/cc.

8

OR

3 (a) Why it is necessary to clean a job before electro-plating and how it is performed?

8

(b) State various types of power supplies used for electrolytic process. Discuss any one in detail.

8

4 (a) Define :
(i) crest speed
(ii) average speed and
(iii) schedule speed.
Also discuss the advantages and disadvantages of 25 kV A.C. system over D.C. system.

8

(b) Discuss the suitability of D.C. series motor for its application in electric locomotive for traction duty.

8

OR

4 (a) Define :

(i) Adhesive weight

(ii) Coefficient of adhesion and

(iii) Tractive effrt

Explain the importance of neutral section in traction system.

8

(b) An electric train is to have a braking retardation of 3.2 kmphs. If the ratio of maximum speed to average speed is 1.3, the time for stop is 26 seconds and acceleration is 0.8 km/hr/sec. Find its schedule speed for a run of 1.5 km. Assume trapezoidal speed time curve.

8

5 (a) Draw the speed time curve for an electric train accelerating uniformly to a speed V_m. Power is cut off and after time 't' when it attains V_m, coasting is allowed to continue upto the end of the run, the braking being neglected. Derive a suitable equation for V_m.

8

(b) An electric train weighing 300 tonnes runs 10% upgradient with following time curve :

(i) Uniform acceleration of 1.5 kmphps for 30 seconds

(ii) Constant speed for 40 seconds.

(iii) Coasting for 30 seconds

(iv) Braking at 2.5 kmphps to rest

Calculate the specific energy consumption if tractive resistance is 45 N/tonne, rotational inertia effect 10%, overall efficiency of transmission and motor 75%.

8

OR

5 (a) Enlist the main components of electric locomotive and state their functions.

8

(b) Two 600 V. motors are started by series parallel control. Each motor takes 400 Amp during starting time of 20 seconds and has 0.1 ohm resistance. Calculate

(i) energy lost in starting rheostat

(ii) energy lost in motor

(iii) motor ouput and

(iv) efficiency of starting.

8