CRASH COURSE

Seventh Semester B.E. Degree Examination, May 2017
Electrical Power Utilization

Time: 3 hrs.   Max. Marks: 100

**Note: *Answer FIVE full questions, selecting
at least TWO questions from each part.***

PART – A

1 a. With a neat sketch, explain the construction and working of Ajax-Wyatt vertical core type furnace. **(06 Marks)**
   b. With a neat sketch explain Butt welding and spot welding. **(06 Marks)**
   c. A 30kW, 3-phase, 400V, resistance oven is to employ nickel chrome strip 0.0254cm thick for 3-star connected heating elements. If the wire temperature is to be 1100°C and that of charge is to be 700°C. Estimate suitable width for strip. Assume emissivity = 0.9 and radiating efficiency = 0.5, the resistivity of element = $1.016 \times 10^{-6}\Omega$-m. **(08 Marks)**

2 a. Discuss the factors that influence on electrodeposition. **(08 Marks)**
   b. State and explain Faraday's laws of electrolysis. **(06 Marks)**
   c. A rectangular plate of 20cm × 10cm is to be coated with nickel layer of 0.2mm thick. Find quantity of electricity in ampere-hour and time taken for the process. Current density is 190 A/m^2 and current efficiency is 60%. Specific gravity of nickel is 8.9. **(06 Marks)**

3 a. State and explain two laws of illumination. **(06 Marks)**
   b. With neat sketch, explain construction and working of sodium vapour lamp. **(08 Marks)**
   c. Two lamps of 250 candle power and 400 candle power are on two lamp posts 100m apart. The posts have different heights of 15m and 30m. Calculate the illumination mid way between the lamp posts. **(06 Marks)**

4 a. Define the following: i) Plane angle; ii) Solid angle; iii) Illumination. **(06 Marks)**
   b. A hall of 28m × 48m is illuminated by indirect lighting using inverted bowl fittings. The average illumination of 108 lumens/m^2 is to be provided on horizontal plane parallel to the floor and 0.75m above it. Design a suitable lighting scheme using filament lamps by taking utilization and depreciation factor as 0.4 and 0.85 respectively. Assume suitable luminous efficiency. **(06 Marks)**
   c. Discuss factory lighting and street lighting. **(08 Marks)**

PART – B

5 a. Discuss requirements of ideal traction. **(06 Marks)**
   b. Assume a trapezoidal speed-time curve and derive an expression for the maximum speed. **(08 Marks)**
   c. A train is running between two stations 2km apart at an average speed of 45kmph. If the maximum speed is to be limited to 65kmph. Acceleration is 2kmphps, coasting retardation is 0.2kmphps and braking retardation is 3kmphps. Determine duration of acceleration, coasting and braking based on quadrilateral speed time curve. **(06 Marks)**

6 a. Define tractive effort. Derive expression for total tractive effort,
$F_t = 277.8 \, W_c \alpha + W_r \pm 98.1 WG.$ **(10 Marks)**

    b. A train accelerates from rest to speed of 50kmph in 25sec. The supply is switched off and coasts for 65 seconds, against a constant resistance of 52Nw/tonne and is braked to rest at 3kmphps in 10 seconds. Calculate: i) Acceleration; ii) Coasting retardation; iii) Schedule speed if the station stops are 20sec duration.
The accelerating weight of train is 1.1 times the dead weight of the train. **(10 Marks)**

7 a. What is regenerative braking? Explain regenerative braking of D.C. series motor. **(06 Marks)**

    b. Discuss: i) Train lighting system; ii) A.C. series motor. **(08 Marks)**

    c. A 250 tonne motor-coach train with four motors takes 20 seconds to attain a speed of 40kmph starting from rest on 1 percent gradient. The gear ratio is 3.5 and gear efficiency 95% wheel diameter is 91.5cm. Train resistance 44Nw/tonne and rotational inertia 10% of dead weight. Find the torque developed by each motor. **(06 Marks)**

8 a. Explain traction motor characteristics. **(06 Marks)**

    b. Write note on hybrid vehicles. **(06 Marks)**

    c. Discuss about linear induction motor and mention its applications. **(08 Marks)**

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