Seventh Semester B.E. Degree Examination, June/July 2011
Electrical Power Utilization

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Discuss the methods of temperature control of resistance oven. **(06 Marks)**
   b. With a neat sketch, explain the working of direct arc furnace. Mention its application. **(06 Marks)**
   c. A 30 kW, 3 phase 400 V resistance oven is to employ nickel chrome strip 0.254 mm thick for the three star connected heating elements. If the wire temperature is to be $1100^{\circ}C$ and that of charge is to be $700^{\circ}C$. Estimate the suitable width and length for the strip. Assume : emmissivity = 0.9, radiating efficiency = 0.5. Take specific resistance of nichrome wire equal to 1.106×10^{-6} ohm-meter. **(08 Marks)**

2 a. Define the term electric welding. What is resistance welding? **(04 Marks)**
   b. What is electric arc welding? Explain : i) metal arc welding and ii) carbon arc welding. **(10 Marks)**
   c. With a neat diagram, explain Butt welding and mention its applications. **(06 Marks)**

3 a. State and explain Faraday's laws of electrolysis. **(06 Marks)**
   b. Explain the following :
      i) Throwing power and   ii) Polarization **(06 Marks)**
   c. A 20 cm long portion of a circular shaft 10 cm diameter is to be coated with a layer of 1.5 mm nickel. Determine the quantity of electricity and time taken for the process. Assume a current density of 195 A/m^2 and a current efficiency of 92 percent. Specific gravity of nickel is 8.9 and its ECE is 1.0954 ampere hour. **(08 Marks)**

4 a. Define the following terms :
      i) Plane angle   ii) Solid angle   iii) Luminous flux **(06 Marks)**
   b. With a neat figure, explain construction and working of fluorescent lamp. **(08 Marks)**
   c. Two lamps L_1 and L_2 are hung at a height of 9 meter from the floor level. The distance between the lamp is 1 m. Lamp L_1 is of 500 C.P. If the illumination on the floor vertically below this lamp is 20 lux, find the candle power of the lamp L_2. **(06 Marks)**

PART – B

5 a. Derive an expression for distance traveled between two stations. Assume trapezoidal speed time curve. **(08 Marks)**
   b. Define : i) Tractive effort and ii) Schedule speed. **(02 Marks)**
   c. A train is required to run between two stations 1.6 km apart at an average speed of 40 kmph. The run is to be made to a simplified quadrilateral speed time curve. If the maximum speed is to be limited to 64 kmph acceleration 2 kmphps and coasting and braking retardation to 0.16 kmphps and 3.2 kmphps respectively. Determine the duration of acceleration, coasting and braking periods. **(10 Marks)**

6 a. Derive expression for total tractive effort for the propulsion of train. **(10 Marks)**

b. An electric train weighing 100 tonnes has a rotational inertia of 10%. This train while running between two stations which are 2.5 km apart has an average speed of 50 kmph. The acceleration and retardation during braking are respectively 1 kmphps and 2 kmphps. The percentage gradient between these two stations is 1% and the train is to move up the incline. The track resistance is 40 N/tonne. If the combined efficiency of the electric train is 60%, determine : i) Maximum power at the driving axle, ii) Total energy consumption and specific energy consumption. Assume that journey estimation is being made on simplified trapezoidal speed time curve. **(10 Marks)**

7 a. Explain series-parallel control of motors. **(06 Marks)**

b. Explain the method of obtaining unidirectional polarity for train lighting. **(06 Marks)**

c. Explain the working of linear induction motor. Mention its applications in traction. **(08 Marks)**

8 a. Mention the advantages of electric vehicle over the conventional internal combustion engine vehicle. **(03 Marks)**

b. Explain tractive effort and transmission requirement for electric vehicle. **(07 Marks)**

c. Discuss the hybrid electric vehicle-working principle, with relevant block diagram. **(10 Marks)**

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