[5460] - 567
T.E. (Electrical)
UTILIZATION OF ELECTRICAL ENERGY
(2015 Pattern) (Semester - II)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*

2) *Assume suitable data, if necessary.*

3) *Use of logarithmic tables, slide rule, Mollier Charts, electronics pocket calculator is and steam table is allowed.*

4) *Figures to the right indicate full marks.*

Q1) a) Calculate the efficiency of a high frequency induction furnace which takes 15 minutes to melt 2 kg of Aluminium. The input to the furance being 5 kW and initial temperature 15°C, Specific heat of Aluminium is 0.88 kJ/kg°C, melting point of Aluminium is 660°C, latent heat of fusion of Aluminium is 32 kJ/kg, 1 kJ = 2.78 × 10^{-4} kWh. **[8]**

    b) Write a brief description of vapour compression refrigeration cycle with a neat diagram. **[6]**

    c) Write a short note on street lighting with principle. **[6]**

<center>OR</center>

Q2) a) Explain Ajax Wyatt furnace with neat diagram. **[6]**

    b) Explain Factors governing electro - deposition. **[6]**

    c) A filament lamp of 500 W is suspended at a height of 5 meter above working plane and gives uniform illumination over an area of 8 m diameter. Assume reflector efficiency as 60%. Determine the illumination on the working plane. Lamp efficiency is 0.9 watt per candle power. **[8]**

Q3) a) Explain advantages of electric traction. **[8]**

    b) Draw block diagram of electric locomotive and describe function of various equipments and accessories. **[8]**

Q4) a) Explain advantages and disadvantages of Steam engine drive. **[8]**

b) Explain composite system of track electrification. **[8]**

Q5) a) Obtain equation of maximum speed with trapezoidal speed time curve with sketch. **[8]**

b) An electric train has quadrilateral speed time curve having uniform acceleration from rest at 2 km/hr for 30 sec, coasting for 50 sec, breaking period of 20 sec. The train is moving up gradient of 1%, tractive resistance is 40 N/tonne rotational inertia effect 10% of dead weight, duration of station stop is 15 sec and overall efficiency of transmission gear and motor as 75%. Calculate schedule speed and specific energy consumption of run. **[8]**

OR

Q6) a) 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 a simplified quadrilateral speed time curve. If the maximum speed is 64 kmph, acceleration is 2 kmphps, coasting is 0.16 kmphps, breaking retardation is 3.3 kmphps. Determine the acceleration time, costing time and breaking time. **[8]**

b) Define with unit **[8]**

   i) Tractive Effort

   ii) Schedule speed

   iii) Average speed

   iv) Coefficient of adhesion

Q7) a) Explain suitability of following motors for traction purpose : **[9]**

   i) DC series motor

   ii) AC series motor

   iii) Linear Induction Motor

b) Obtain efficiency for Series parallel starting of two motors. **[9]**

OR

Q8) a) Explain following transition methods with neat diagram. **[9]**

    i)   Open Transition

    ii)   Shunt Transition

    iii)   Bridge Transition

b) A 2340 tonne train including loco proceeds down a gradient of 1 in 80 for 5 minutes during which its speed gets reduced from 60 kmph to 36 kmph by application of regenerative breaking. Find the energy returned to the lines if the tractive resistance is 5 kg/tonne, rotational inertia 10% and overall efficiency of the motor during regeneration is 70%. **[9]**

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