**[4958]-1070**

# T.E.(Electrical.)

# UTILIZATION OF ELECTRICAL ENERGY

## (2012 Pattern)(Semester-II) (End sem)

*Time :2½Hours]*                                                        *[Max. Marks : 70*

*Instructions to the candidates:*

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

*2) Figures to the right side indicate full marks.*

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

*4) Assume suitable data if necessary.*

*Q1)* a)  Define:                                                              **[6]**

       i)  Solid Angle

       ii)  Reflection factor

       iii)  Coefficient of Utilization

   b)  Write a note on Anodizing.                                         **[6]**

   c)  A piece of an insulating material is to be heated by dielectric heating. The size of the piece is 12 cm X 12 cm X 3 cm. A frequency of 30 MHz is used and the power absorbed is 500 watt. If material has relative permittivity of 5 and power factor of 0.05. Calculate.     **[8]**

       i)  The voltage necessary for heating

       ii)  Current flowing through the material

       iii)  Frequency to get the same loss if voltage were limited to 1700 V.

<div align="center">OR</div>

*Q2)* a)  Explain construction and working of

       i)  Push button

       ii)  Contactor                                                     **[6]**

   b)  With suitable diagram explain mercury vapour lamp.              **[6]**

   c)  An electric furnace consuming 5 KW takes 15 minutes to just melt 4lbs of aluminium, the initial temperature being 15°C. Find the efficiency of the furnace. Specific heat of Aluminium is 0.212, melting point is 658°C and latent heat of fusion  is 76.8 cal per gram. 860 K cal = 1KWH.   **[8]**

*Q3)* a) Compare steam engine drive and electric drive. **[8]**

b) Describe composite system. **[8]**

OR

*Q4)* a) Draw and explain block diagram of electric locomotive. **[8]**

b) Explain functions of following equipments in traction substation. **[8]**

    i) Circuit breaker.

    ii) Interrupter

*Q5)* a) Define: **[8]**

    i) Average Speed

    ii) Schedule speed

    iii) Coefficient of adhesion

    iv) Tractive effort

b) 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 to 2 kmphps and coasting and breaking retardation to 0.16 kmphps and 3.2 kmphps respectively. Determine the duration of acceleration, coasting and breaking periods. Also draw speed-time curve. **[8]**

OR

*Q6)* a) Derive the expression for simplified quadrilateral speed time curve. **[8]**

b) An electric train weighing 200 tonne has eight motors geared to driving wheel, each wheel is 90 cm diameter. Determine the torque developed by each motor to accelerate the train to a speed of 48 kmph in 30 seconds up a gradient of 1 in 200. The tractive resistance is of 50 N/tonne. The effect of rotational inertia is 10% of the train weight, the gear ratio is 4 to 1 and gearing efficiency is 80%. **[8]**

*Q7)* a) Explain French method of Regenerative braking. **[6]**

b) What are the desirable characteristics of motor for traction purpose. **[6]**

c) A motor coach weighing 150 tonne is equipped with 4,600 V motors for series parallel control. The current per motor is 300 A. Calculate **[6]**

  i)   Duration of starting period

  ii)  Speed of the train at transition

  At 300 A, 600 V, tractive effort is 15000 N per motor and the train speed is 30 kmph. Assume that train is started up a gradient of 1% and train resistance is 10N per tonne. Allow 10% for the effect of rotational inertia. Each motor has a resistance of 0.1 ohm.

<div align="center">OR</div>

*Q8)* a) How A.C series motor is suitable for traction. **[6]**

  b) Explain transition methods with neat diagram. **[6]**

  c) Derive the expression for energy lost and efficiency for series parallel control of two DC series motor. **[6]**

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