Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (EE) (Separate Supple)/SEM-7/EE-703/2011

2011
UTILIZATION OF ELECTRIC POWER

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Quadrilateral Speed – Time curve is the close approximation for-
   a) Urban service
   b) Suburban service
   c) Urban / Suburban service
   d) Main line service.

   ii) The Train resistance (friction) is given by –
   a) a (constant) b) b v
   c) $c\ v^2$ d) $a + bv + c\ v^2$.

   iii) The normal value of coefficient of adhesion is –
   a) 0·25 b) 0·35
   c) 0·50 d) 1·50

   iv) Specific energy consumption is affected by –
   a) acceleration & retardation values
   b) the crest speed and nature of route
   c) distance between stops
   d) All of the above.

v) The initial stage of braking in main line service should be –

a) Regenerative braking b) Dynamic braking

c) Mechanical braking d) All of these.

vi) The most common traction system in India is–

a) D.C. Traction (600v) b) D.C. Traction (750v)

c) A.C. Traction (25 kv) d) A.C. Traction (1500v).

vii) Hysteresis and Eddy current heating are used in –

a) Resistance heating

b) Dielectric heating

c) Induction heating of steel

d) Induction heating of brass.

viii) Brightness of a surface

a) is same in all directions

b) follows cosine law

c) follows Lambert's law

d) all the above.

ix) The welding transformer should have –

a) Rising V-I characteristic

b) Horizontal V-I characteristic

c) Drooping V-I characteristic

d) None of these.

x) The coefficient of utilization increases with –

a) Direct lighting

b) Mounting height of lamp

c) Floor area

d) All of these.

xi) The solid angle subtended at the centre of a spherical surface is

a) 360 b) 4π

c) 2π d) 0.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Derive an expression for the tractive effort to overcome gravitational force and tractive effort to overcome train resistance.
3. Explain the coefficient of adhesion and its importance in traction. Explain how adequate adhesion is ensured.
4. Discuss the limitations on the choice of very high frequency in Dielectric heating.
5. a) Briefly explain what are the different methods of light control.
   b) What is glare ? How glare is avoided ?
6. Explain with necessary equations how the length and diameter of the heating element of a furnace are estimated ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Derive the relationship between acceleration, braking, retardation, maximum speed, speed at the end of the coasting time and distance of run in case of a train having quadrilateral speed-torque curve.
   b) Briefly explain what are the factors affecting specific energy consumption ?

8. a) Briefly explain the principle of induction heating at high frequency and highlight few applications of eddy current heating.

   b) The depth of penetration, in the case hardening of a steel work-piece required is $1 \cdot 5$ mm. The relative permeability is unity and specific resistance of steel is $6 \times 10^{\wedge} - 7$ ohm m. Determine the frequency required (Take u = 1).

9. a) Derive the expression for heat produced in Dielectric heating.

   b) Dielectric heating is to be employed to heat a slab of insulating material 1 cm thick and 150 sq cm in area. The power required is 400 Watts. And a frequency of 30 MHZ is to be used. The material has a rel. permitivity of 5 and a power factor of $0 \cdot 05$. Determine the voltage necessary and current that will flow through the slab.

10. Write short notes on (any three) :

    a) Regenerative Braking

    b) Linear induction motor

    c) Resistance welding

    d) Compact fluorescent lamp

    e) Colour rendition

    f) Current collection in Traction

    g) Induction heating.