Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech (EE-NEW)/SEM-7/EE-703/2010-11
2010-11
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 × 1 = 10

   i)   A *d.c.* shunt motor drives a load at rated speed and at
        rated voltage. If both the load and the supply voltages
        are halved, the speed of the motor will nearly be

        a)   doubled

        b)   halved

        c)   the same as before

        d)   less than the rated speed.

7428   [Turn over

ii) Steel rails are welded by

   a) Argon arc welding   b) Thermit welding

   c) Gas welding   d) Resistance welding.

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

   a) 360°   b) 4π

   c) 2π d) none of these.

iv) The drawback(s) of regenerative braking is/are

   a) additional equipment is required for control regeneration and for protection of machines/equipment

   b) the *d.c.* machines required for regenerative braking are of large size than those ordinarily employed

   c) the operation of substations becomes complicated and difficult

   d) all of these.

v) Dynamic braking is very effective if the *d.c.* motor

   a) is series excited

   b) is shunt excited

   c) is separately excited

   d) has cumulative compound excitation.

vi) A power chopper converts

a) *a.c.* to *d.c.*   b) *d.c.* to *d.c.*

c) *d.c.* to *a.c.*   d) *a.c.* to *a.c.*

vii) A perfect black body is one which

a) absorbs all incident radiations

b) reflects all incident radiations

c) transmits all incident radiations

d) all of these.

viii) Which of the following lamps gives nearly monochromatic light ?

a) Fluorescent tube   b) Sodium vapour lamp

c) Mercury vapour lamp   d) GLS lamp.

ix) Non-conducting materials are heated by

a) eddy current heating   b) arc heating

c) induction heating   d) dielectric heating.

x) Ajax-Wyatt furnace is started when

a) it is filled below core level

b) it is filled above core level

c) it is fully empty

d) none of these.

xi) Due to which of the following reasons Aluminium is difficult to weld ?

a) It has an oxide coating

b) It conducts away heat very rapidly

c) Both (a) & (b)

d) None of these.

GROUP – B
(Short Answer Type Questions)

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

2. State the advantages of dielectric heating.

3. Why is electric heating preferred over other forms of heating ?

4. Prove that in a filament lamp, the diameter of filament is directly proportional to $I^{2/3}$ where I is the current flowing in the filament.

5. a) State the laws of illumination.

   b) Define the following :

      i) Glare

      ii) MHCP

      iii) MSCP.   3 + 2

6. Explain with diagram the principle of regenerative braking.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Draw the equivalent circuit of an arc furnace.   3

   b) A three phase electric arc furnace has the following data :

   Current drawn : 5000 A

   Arc voltage : 50 V

   Resistance of transformer referred to the secondary : 0·002 Ω

   Reactance of transformer referred to the secondary : 0·004 Ω

   i) Calculate the p.f. and the kW drawn from the supply.

   ii) If the overall efficiency of the furnace is 65%, find the time to melt 2 tonnes of steel. Given the latent heat of steel = 8·89 kcal/kg, specific heat of steel = 0·12, melting point of steel = 1370° C and the initial temperature of steel is 20° C.   12

8. Explain the flux method of calculation for interior lighting.

    An illumination on the working plane of 32 lux is required in a room of 80 m × 15 m. The lamps are required to be hung 4·5 m above the work bench. Assume a utilization factor of 0·5, lamp efficiency of 1·4 lumens per watt and candle power depreciation of 0·2, estimate the number of lamps and disposition of the lamps. Assume spacing/height ratio of 1·5.

9. a) Discuss various arrangements of current collection used in electric traction.   5

    b) Discuss the advantages of series-parallel control of starting as compared to the rheostatic starting for a pair of *d.c.* traction motors.   6

    c) Define the term "coefficient of adhesion" and explain the factors on which it depends.   4

10. Describe with diagram the principles and operation of electric power supply equipment used in welding for the following :

    a) Thyristor controlled rectifier unit for arc welding.   5

    b) Ignitron controller for resistance welding.   5

    c) Thyratron ignited ignition controller for resistance welding of short durations.   5

11. Write short notes on any *three* of the following : 3 × 5

    a)   Laser welding

    b)   Anodizing and its application

    c)   Conductor rail system

    d)   Linear induction motor

    e)   Fluorescent lamp.