Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EE)/SEM-7/EE-703/2012-13

2012

UTILISATION 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 the following : 10 × 1 = 10

i) An auto transformer used sodium vapour lamp should have

a) higher step-up ratio

b) high step down ratio

c) high leakage resistance

d) high efficiency.

ii) For welding aluminium alloys, the method used is

a) Tungston arc welding

b) Acetylene oxygen gas welding

c) D.C. arc welding

d) A.C. arc welding.

iii) Induction heating is used for

a) insulating material

b) magnetic material

c) conducting non-magnetic material

d) magnetic and conducting material.

iv) Quadrilateral speed-time curve is a better approximation to the actual conditions for

a) sub-urban services

b) urban services

c) main line service

d) urban and sub urban servie.

v) At low frequency of the order of $\frac{1}{2}$ Hz to 10 Hz the induction motors develop :

a) high starting torque with excessive starting current

b) high starting torque without excessive starting current

c) low starting torque with excessive starting current

d) low starting torque without excessive starting current.

vi) When the speed of the train is estimated taking into account the time of stop at a station in addition to the actual running time between stops, is known as

a) Average speed b) Schedule speed

c) Notching speed d) Free running speed.

vii) A train has a schedule speed of 36 km per hour on a level track. If the distance between the stations is 2 km and the stoppage is 30 seconds the actual time of run will be

a) 260 seconds b) 230 seconds

c) 200 seconds d) 170 seconds.

viii) For rheostatic breaking of two series motors connected in parallel

a) equalizer connection is better

b) cross connection is better

c) both are equally good

d) none of these two is used.

ix) It is desirable to operate the arc furnace at

a) unity pf b) 0.707 pf

c) 0.8 pf d) 0.5 pf.

x) In arc welding better results are obtained when arc length is equal to

a) 3/4″

b) 1

c) half the diameter of electrode

d) diameter of the electrode.

GROUP – B
(Short Answer Type Questions)

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

2. A 250 volt lamp has a total flux of 3000 lumen and takes current of 0.6 amp. Calcuate
   a) lumen/watt
   b) M.S.C.P./watt.
3. a) State the laws of illumination.
   b) Calcualate the total flux from the lamp having mean spherical candle power of 35.
4. Describe different ways of supply system for electric traction with their merits and demerits.
5. Explain briefly the following :
   i) Space-height ratio
   ii) Utilization factor
   iii) Depreciation factor.
6. Describe the conditions of maximum output for an electric arc furnace.

GROUP – C
(Long Answer Type Questions)

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

7. a) What do you understand by speed-time cures ? What is its use in practice ?
   b) An electric train has an avg.-speed of 42 km/hr. on a level track between stops 1400 apart. It is accelerated at 1.7 km/hr./sec. and is braked at 3.3 km/hr./sec. Draw the speed-time curve for the run. 5 + 10

8. A 100 tone electric train has a rotational inertia of 10%. This train while running between two stations which are 2.5 km retardation during braking are respectively 1 km/hr./sec and 2 is 1 percent and the train is to move up the incline. The electric train is 65 percent, determine

   i) Total energy output at driving axles

   ii) Total energy consumption

   iii) Specific energy consumption.

   Assume that journey estimation is being made in simplified trapezoidal speed-time curve.

9. a) What is a polar curve ? Explain Rousseau's construction for calculating M.S.C.P. of a lamp.

   b) A 60 candle power, 250 volt metal filament lamp has a measured cnadle power of 71.5 candle at 260 volt and 50 candle at 240 volt metal filament lamp has a measured candle at 240 volt calculate

      i) The constant for the lamp is the expression $c = av^6$, where c = candle power and V = Voltage.

      ii) The change of candle power per volt at 250 volt.

      iii) The percentage variation of candle power due to a voltage variation of 4 percent from the normal value. 6 + 9

10. a) Explain construction, operation performance and application of arc furnance. Illustrate your answer by appropriate graphs.

    b) Derive the condition for maxinum output in an arc furnace. 10 + 5

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

    a) High pressure mercury vapour lamp

    b) Integrating sphere

    c) SCADA system in traction

    d) Buck Boost method of speed control in traction system

    e) Laser welding.