CS/B.TECH/EE (NEW)/SEM-7/EE-702/2013-14

2013

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) Illumination level required for precision work is approximately

a) 50 lm/m^2 b) 500 lm/m^2

c) 100 lm/m^2 d) 200 lm/m^2.

ii) In arc welding aluminium alloys, the method used is :

a) Tungsten arc welding

b) A.C arc welding

c) D.C arc welding

d) Acetylene oxygen arc welding.

iii) Power supply required for electrolytic process is

a) alternating current (100 - 200A) at very low voltage (10 or 12V).

b) direct current (100 – 200A) at very high voltage.

c) direct current (100 - 200A) at very low voltage (10 or 12V).

d) alternating current at very high voltage.

iv) 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.

v) An auto transformer used with sodium vapor lamp should have

a) higher step-up ratio

b) high leakage resistance

c) high step down ratio

d) high efficiency.

vi) 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.

vii) Candela is the unit of

a) flux b) luminous intensity

c) illumination d) luminance.

viii) the type of dc motor used in electric traction is

a) series b) shunt

c) separately excited d) none of these.

ix) Non-conducting materials are heated by

a) eddy current heating b) arc heating

c) induction heating d) dielectric heating.

x) In a resistance furnace the atmosphere is

a) oxidising b) deoxidising

c) reducing d) neutral.

xi) Tractive effort is required to

a) overcome the gravity component of train mass

b) over cone friction windage & curve resistance

c) accelerate the train mass

d) all of these.

GROUP - B

(Short Answer Type Questions)

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

2. State and explain the laws of Illumination. What is the difference between illumination and luminous intensity ?

3 + 2

3. a) Discus the advantages of series parallel control of starting as compared to the rehostatic starting for a pair of dc traction motors.

b) What is the difference between dead weight and acceleration weight ? 3 + 2

4. Discuss the various methods of controlling the temperature in resistance ovens.

5. Explain the operations of the following with circuit diagrams :

a) LP sodium vapour lamp

b) HP mercury vapour lamp

6. Distinguish the speed-time curve for train movement for urban, suburban and main line service.

GROUP – C

(Long Answer Type Questions)

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

7. a) Define the term "coefficient of adhesion" and explain the factors on which it depends. 5 + 10

   b) The average distance between stops on a level section of a railway is 1.25 km. Motor – coach train weighing 200 tonne has a schedule speed of 30km/h, the duration of stops being 30 seconds. The acceleration is 1.9km/h/s and the braking retardation is 3.2km/h/s. Train resistance to traction is 45n/t. Allowance for rotational inertia is 105. Calculate the specific energy output in w-h/t-km. Assume a trapezoidal speed-time curve.

8. a) What is dielectric heating ? 3

   b) Write the applications of dielectric heating. 4

   c) A slab of insulating material 130 cm^2 in area and 1 cm thick is to be heated by dielectric heating. The power required is 380 W at 30 Mhz. Material has a relative permittivity of 5 and p.f of 0.05. Absolute permittivity = 8.854x 10^{-12} F/m. Determine the necessary voltage. 8

9. State the law of electrolysis. What is meant by anodizing ? Explain the process of anodizing and describe the equipment used for it. Calculate the ampere-hour required to deposit a coating of silver 0.05mm thick on a sphere of 5cm radius. Assume electro-chemical equivalent of silver = 0.001118 and density of silver to be 10.5 units.

10. a) Describe the working principle of Direct Core type Induction Furnace.

    b) Discuss the advantages of Coreless Induction Furnace.

    c) A low frequency induction furnace, whose secondary voltage is maintained constant at 10 volts, takes 400 kW at 0.6 power factor when the hearth is full. Assuming the resistance of the secondary circuit to vary inversely as the height of the charge and reactance to remain constant, find the height upto which hearth should be filled to obtain maximum heat. 4 + 4 + 7

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

a) Electroplating.

b) Efficiency of Series-Parallel control of traction motors.

c) Integrating sphere.

d) Power supply requirements for electrolytic process.

e) Arc furnaces.