



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH(EE) / SEP.SUPPLE / SEM-7 / EE-703 / 2012

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.*

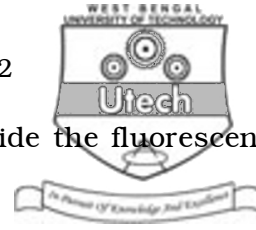
GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$$10 \times 1 = 10$$

- i) Candela is the unit of
 - a) Luminous flux
 - b) Luminous intensity
 - c) Brightness
 - d) Luminous efficiency.
- ii) In filament lamps, coiled coil filaments are used in
 - a) coloured lamps
 - b) gasfilled lamps
 - c) low wattage lamps
 - d) higher wattage lamps.



iii) Which of the following is present inside the fluorescent tube ?

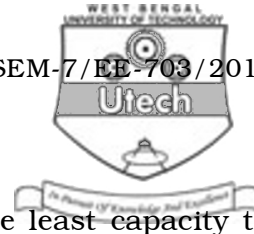
- a) Helium and Oxygen
- b) Argon and Neon
- c) Argon and Carbon dioxide
- d) Mercury vapour.

iv) In case of a fluorescent lamp if only the ends of the lamp remain lighted it indicates

- a) short circuited starter
- b) a defective choke
- c) a defective tube
- d) wrong wiring.

v) The average life of sodium lamps is around

- a) 1000 hours
- b) 2500 hours
- c) 6000 hours
- d) 10000 hours.



- vi) Which of the following lamps has the least capacity to sustain voltage fluctuations ?
- a) Sodium vapour lamp
 - b) Incandescent lamp
 - c) Fluorescent lamp
 - d) Mercury vapour lamp.
- vii) The speed-time curve for urban service has no
- a) costing period
 - b) free running period
 - c) breaking period
 - d) acceleration period.
- viii) For tramways the return circuit is completed through
- a) common earthing
 - b) neutral wire
 - c) special cable
 - d) track rails.



ix) The air resistance to the movement of the train is proportional to

- a) $1/\text{speed}$ b) speed
- c) $(\text{speed})^3$ d) $(\text{speed})^2$.

x) Long distance railways operate on

- a) 600 V DC b) 15 kV three phase AC
- c) 25 kV three phase AC d) 25 kV single phase AC.

xi) The supply frequency usually employed for high frequency eddy current heating is

- a) 10 MHz b) 5 kHz
- c) 1 kHz d) 10 kHz to 400 kHz.

xii) The normal voltage used in dielectric heating is

- a) 1.5 kV b) 15 kV
- c) 33 kV d) 66 kV.

xiii) In an electric arc welding the voltage required to strike DC arc is about

- a) 50 – 60 V b) 80 – 90 V
- c) 100 – 120 V d) 230 V.



xiv) During spot welding the current flows for

- a) fraction of a minute
- b) fraction of a second to several seconds
- c) few milliseconds
- d) few microseconds.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- 2. Define crest speed, average speed and schedules speed of an electric locomotive
- 3. What is stroboscopic effect ? Draw relevant diagrams to illustrate and explain how this effect can be overcome.
- 4. What is glare ? How is it produced ? Suggest a few measures to minimise the glare.
- 5. Explain why neutral section is provided in the OHE in AC traction system and not in DC traction system.
- 6. Write a brief note on different types of resistance welding.



GROUP – C

(Long Answer Type Questions)

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

7. a) State the laws of illumination.
- b) Explain the factors to be taken into account for designing schemes for :
- (i) stadium lighting
 - (ii) highway lighting
 - (iii) shop window.
- c) Design the lighting scheme of a hall measuring 20 m × 50 m which is to be illuminated with 45 lux. The following data may be used.

Mounting height from the working plane = 3 metre,

Utilisation factor = 0.65, Depreciation factor = 1.3. The

lamps are to be chosen from the following groups :

Rating (W)	75	100	150	200
Total lumens	800	1200	2000	2800

Calculate the number of lamps of each type. $4 + 3 + 8$



8. a) Why is AC preferred to DC system for supplying power to electric traction ?
- b) Draw and explain typical speed-time curve for train improvement for suburban service and mainline service.
- c) An electric train has an average speed of 42 km/hr on a level track between stops 1.4 km apart. It is accelerated at 1.7 kmphps and is braked at 3.3 kmphps. Assume tractive resistance is 50 N/T, allowing 10% for rotational inertia and motor efficiency 85%, estimate the specific energy consumption. 4 + 4 + 7
9. a) What is the basic difference between resistance welding and arc welding ?
- b) What are the factors which limit the choice of frequency in dielectric heating ?
- c) Explain the principle of induction heating.
- d) Estimate the energy required to melt 500 kg of brass in a 1-phase Ajax-Wyatt furnace. If the melt is to be carried out in $\frac{3}{4}$ hr, what must be the average power input to the furnace ?



Given :

Specific heat of brass = $393.6 \text{ J/kg/}^\circ\text{C}$

Latent heat of fusion of brass = $163 \times 10^3 \text{ J/kg}$

Melting point of brass = 920°C

Initial temperature of brass = 20°C

Furnace efficiency = 70% . 2 + 2 + 4 + 7

10. a) Draw a neat sketch of high pressure sodium vapour lamp and label its different parts.
- b) Explain the working principle of the above lamp. 10 + 5
11. Write short notes on any *three* of the following : 3 × 5
- a) Regenerative braking of electric motors
 - b) Mercury vapour lamp
 - c) Halogen lamp
 - d) TIG welding
 - e) Coreless induction furnace
 - f) Microwave oven.
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