

Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech(EE-NEW)/SEM-7/EE-703/2009-10**2009****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) Trapezoidal 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 services.
- ii) is used for heating non-conducting material.
- a) Eddy current heating
 - b) Arc heating
 - c) Induction heating
 - d) Dielectric heating.
- iii) The unit of illumination is
- a) lumen
 - b) lambert
 - c) lux
 - d) steradians.

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- iv) Stroboscopic effect is related to
 - a) fluorescent lamp
 - b) incandescent lamp
 - c) night lamp
 - d) none of these.
- v) Steel rails are welded by
 - a) argon arc welding
 - b) thermit welding
 - c) gas welding
 - d) resistance welding.
- vi) Colour of light depends on
 - a) frequency
 - b) wavelength
 - c) speed of light
 - d) both frequency and wavelength.
- vii) For two filaments of same material operating at the same temperature, the diameter and current through filament are related by
 - a) diameter directly proportional to current
 - b) diameter proportional to (current) ²
 - c) diameter proportional to (current) ^{2/3}
 - d) none of these.
- viii) Filament lamp at starting will take current
 - a) equal to its full running current
 - b) more than its full running current
 - c) less than its full running current
 - d) none of these.
- ix) An auto transformer used with sodium vapour lamp should have
 - a) higher step-up ratio
 - b) high leakage resistance
 - c) high step-down resistance
 - d) high efficiency.

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- x) The method that can bring the locomotive to standstill is
 a) Rheostatic braking b) Regenerative braking
 c) Plugging d) none of these.
- xi) In arc welding the temperature of the arc is about
 a) 150°C b) 1540°C
 c) 3500°C d) 10000°C.

GROUP - B**(Short Answer Type Questions)**Answer any *three* of the following. $3 \times 5 = 15$

2. a) Discuss the advantages of series parallel control of starting as compared to the rheostatic starting for a pair of DC traction motors. $3 + 2$
 b) What is the difference between dead weight and acceleration weight ? $3 + 2$
3. What are polar curves ? Mention the uses of polar curves. $2 + 3$
4. Explain the operation of the following with circuit diagram :
 a) LP sodium vapour lamp
 b) HP mercury vapour lamp. $2 + 3$
5. Describe a coreless induction furnace.
6. Discuss various methods of controlling the temperature in resistance ovens.

GROUP - C**(Long Answer Type Questions)**Answer any *three* of the following. $3 \times 15 = 45$

7. State the advantages of electric heating. Explain the principle of induction heating. What are the applications of induction heating ? What is dielectric heating and dielectric loss ? Estimate the energy required to melt 0.5 tonne of brass in a single-phase induction furnace. If the melt is to be carried out in 0.5 hour, what must be the average power input in the furnace ? $3 + 3 + 2 + 3 + 4$

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8. Derive an expression for tractive effort required for propulsion of a train during
- acceleration
 - free running
 - coasting
 - moving down a gradient.
9. a) What do you mean by specific energy consumption ? What are the factors that affect the specific energy consumption of a train ?
- b) An electric train has an average speed of 42 kmph on a level track between stops 1400 m apart. It is accelerated at 1.7 kmphps and is braked at 3.3 kmphps. Draw the speed-time of the run. Estimate the energy consumption at the axles of the train per tonne km. Take tractive resistance constant at 50 Nw per tonne and allow 10 per cent for rotational inertia. $(2 + 3) + (5 + 5)$
10. a) Explain the factors to be taken into account for designing schemes for (i) street lights (ii) flood lighting and (iii) highway lighting.
- b) Filament lamp of 200W is suspended at a height of 5 metres above working plane and gives uniform illumination over an area of 4 metre diameter. Assume efficiency of reflector as 50%. Determine the illumination on the working plane. Efficiency of lamp is 0.89 Watt / C.P. $(3 + 3 + 3) + 6$
11. Write short notes on any *three* of the following : 3×5
- Laser welding
 - Dielectric heating
 - Anodizing and its application
 - Conductor rail system
 - Laws of illumination.