

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 : $10 \times 1 = 10$

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.

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- 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.

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- 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.

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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. $3 \times 5 = 15$

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.
6. Explain with diagram the principle of regenerative braking.

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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 : 0.002Ω Reactance of transformer referred to the secondary : 0.004Ω

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

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

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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.
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