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Seventh Semester B.E. Degree Examination, January/February 2006
Electrical & Electronics Engineering
Electrical Power Utilization

Time: 3 hrs.)

(Max.Marks : 100)

Note: Answer any FIVE full questions.

1. (a) With a neat sketch explain the working of a vertical core type furnace. (8 Marks)
- (b) What are the important features of high frequency eddy current heating? Mention its applications. (6 Marks)
- (c) A piece of insulating material is to be heated by dielectric heating. The size of the piece is $10 \times 10 \times 3$ cm. A frequency of 20 MHz is used and the power absorbed is 400 W. Calculate the voltage necessary for heating and the current with the relative permittivity of 5 and the power factor of 0.05. (6 Marks)
2. (a) What do you mean by electric welding? Explain the various types of resistance welding. (8 Marks)
- (b) What is meant by negative resistance of an arc? How can it be overcome? (4 Marks)
- (c) Explain the factors affecting the appearance of deposition in electro-deposition. (8 Marks)
3. (a) State and explain laws of illumination.
- (b) With neat sketch explain the operation of Lummer-Brodhum photometer. (7 Marks)
- (c) A hall $27.75m \times 45.75m$ is illuminated by indirect lighting employing inverted bowl fitting. An average illumination of 108 lumens per sq.m is to be provided on a horizontal plane parallel to the floor and 0.75 m above it.
 Co-efficient of utilization = 0.35 and precision factor = 0.9.
 Design a suitable scheme of illumination
 Luminous efficiency for 100W lamp = 13.4 lumens/watt
 Luminous efficiency for 200W lamp = 14.4 lumens/watt (7 Marks)
4. (a) With their merits and demerits explain any two types of traction systems. (6 Marks)
- (b) Using a trapezoidal speed-time curve, derive an expression for its maximum speed. (8 Marks)
- (c) An electric train has a schedule speed of 25 kmph between stations 800 m apart. The duration of station stop is 20sec, the maximum speed is 20% higher than the average running speed and the braking retardation is 3 kmphs. Calculate the rate of acceleration required to operate the service. (6 Marks)
5. (a) Define specific energy consumption and mention the factors affecting it. (6 Marks)

- (b) Define adhesive weight and co-efficient of adhesion. (4 Marks)
- (c) An electric train weighing 300 tonnes runs 10% up gradient with uniform acceleration of 1.5 kmphs for 30 secs, constant speed for 40 secs, coasting for 30 secs, braking at 2.5 kmphs to rest. Calculate the specific energy consumption if tractive resistance is 45N/tonne, rotational inertia effect 10%, overall efficiency of transmission and motor 75%. (10 Marks)
6. (a) Explain the method of series parallel control used for DC motors. (10 Marks)
- (b) An electric train weighing 132 tonnes is equipped with 4 motors of 600 V arranged in two pairs for series-parallel control. If during series parallel starting, the current per motor is maintained at 400 V, estimate:
- Duration of starting speed
 - Speed of train at transition
 - Rheostatic losses during a) series and b) parallel steps of starting.
- At 400 A and 600 V tractive effort/ motor is 19,270 NW and the train speed is 39 kmph. Gradient 1 in 100 and traction resistance is 44.5 N/tonne. Allow 10% for the effect of rotational inertia. Each motor has a resistance of 0.1Ω . (10 Marks)
7. (a) What are the causes of low p.f? How can low pf be avoided? (6 Marks)
- (b) Obtain an expression for most economical pf for a consumer based on constant kW demand. (8 Marks)
- (c) A system is working at its maximum KVA capacity with a lagging pf of 0.71. An anticipated increase of load could be met by (1) raising the pf of the system to 0.87 by phase advancers. Estimate the limiting cost/KVA to justify its use if the cost of generating plant is Rs 60/KVA, if an extra generating plant is added to meet the increased power demand. Interest and depreciation charges may be assumed to be 10% in each case. (6 Marks)
8. Write short notes on any FOUR
- Principles of extraction of metals
 - Modern welding techniques and their advantages
 - Speed-time curves of various services
 - Flourecent lamp
 - Linear Induction motor
- (5×4=20 Marks)

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