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Seventh Semester B.E. Degree Examination, May/June 2010
Electrical Power Utilization

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

1.
 - a. What are the advantages of electric heating over other forms of heating? (04 Marks)
 - b. Estimate the energy required to melt 500 kg of brass in a single 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 J per kg per degree centigrade
Latent heat of fusion of brass = 163 kJ per kg
Temperature of brass at cold = 20 degree centigrade
Melting point of brass = 920 degree centigrade
Assume a furnace efficiency of 70%
1 kWh = 3.6 MJ (06 Marks)
 - c. Discuss briefly various types of resistance welding techniques. (10 Marks)

2.
 - a. State Faraday's laws of electrolysis. (04 Marks)
 - b. Briefly discuss the factors affecting electro-deposition process. (06 Marks)
 - c. A 20 cm long portion of a circular shaft 10 cm diameter is to be coated with a layer of 1.5 mm nickel. Determine the quantity of electricity in ampere-hours and the time taken for the process. Assume a current density of 195 A/m², and a current efficiency of 92%, specific gravity of nickel is 8.9, electro chemical equivalent of nickel in 1.0954 kg per 1000 ampere-hours. (10 Marks)

3.
 - a. State and prove, i) Inverse square law ii) Lambert's cosine law with respect to illumination. (10 Marks)
 - b. A section of a road is to be illuminated by two lamps of 500 cp and 400 cp both being horizontally 20 mt apart and are suspended 6 mt above the surface level. Calculate illumination at 'A' directly below the lamp of 500 cp and at 'B' directly below the lamp of 400 cp. Also calculate illumination at 'C' in the middle of 'A' and 'B'. (10 Marks)

4.
 - a. It is desired to flood light the front of a town hall in an industrial area. The dimensions are 45 mt×15 mt and the front of the building is of Portland stone. The projectors can be located at ground level 15 mt away. A standard medium angle reflector having a beam spread of 25 degree is used. Estimate the number of 1000 watts lamp projectors used. Assume: illumination required on the wall is 80 lux, waste light factor is 1.2, depreciation factor is 1.5, coefficient of utilization is 0.4, lumens output of each 1000 watt lamp is 18.9 lumens per watt. (10 Marks)
 - b. With a neat sketch, explain the working of a sodium vapour lamp and mention its applications. (10 Marks)

PART – B

- 5 a. What are the various systems of traction? State any two advantages and any two disadvantages of internal combustion engine with electric drive system of traction. (07 Marks)
- b. A schedule speed of 45 km per hour is required between two stops 1.5 km apart. Find the maximum speed over the run if the stop is of 20 seconds duration. The values of acceleration and retardation are 2.4 kmphs and 3.2 kmphs respectively. Assume a simplified trapezoidal speed-time curve. (08 Marks)
- c. Define for a train the following:
i) Tractive effort ii) Dead weight iii) Accelerating weight iv) Adhesive weight
v) Coefficient of adhesion. (05 Marks)
- 6 a. What are the general features for the selection of traction motors (state any four)? (04 Marks)
- b. What is the principle of series-parallel speed control of motors? Explain how energy is saved by series-parallel control of motors. (08 Marks)
- c. A 355 tonne train has its speed reduced from 85.5 to 48.3 kmph in traveling 1525 mt, down a uniform gradient of one in ninety (i.e. 1 in 90). If regenerative braking is used, determine the energy in kWH returned to line. Take 10% allowance for rotational inertia, 53 N/tonne for tractive resistance and the overall efficiency as 80%. (08 Marks)
- 7 a. Derive an expression for specific energy consumption of a train using simplified trapezoidal speed-time curve. (10 Marks)
- b. Write a note on linear induction motor and its application in traction system. (10 Marks)
- 8 Write short notes on the following:
- a. Electric vehicles (10 Marks)
- b. Hybrid electric vehicles. (10 Marks)

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