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Seventh Semester B.E. Degree Examination, July/August 2022

Utilization of Electrical Power

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Briefly explain with neat diagram, Direct and Indirect resistance heating. (06 Marks)
- b. With a neat sketch, explain the construction and working of Ajax Wyatt vertical core type furnace. (06 Marks)
- c. A 30 kW, 3 phase, 400 V resistance oven is to employ nickel chrome strip 0.025 cm thick for the 3 phase Y connected heating elements. If the wire temperature is to be 1100°C and that of charge is to be 700°C. Estimate a suitable width for the strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. The specific resistance of the richrome alloy is $1.03 \times 10^{-6} \Omega - m$. State any assumption made. (08 Marks)

OR

- 2 a. Explain the following terms :
 - (i) ECE.
 - (ii) Current efficiency.
 - (iii) Energy efficiency. (06 Marks)
- b. State and explain Faraday's laws of Electrode position. (06 Marks)
- c. Explain Butt welding and spot welding with neat diagram. (08 Marks)

Module-2

- 3 a. Define the following terms:
 - (i) Illumination
 - (ii) Luminous efficiency.
 - (iii) MSCP
 - (iv) Depreciation factor.
 - (v) Space height ratio.
 - (vi) Luminous flux. (06 Marks)
- b. Explain the two laws of illumination. (06 Marks)
- c. A lamp of 400 watts having MSCP of 1000 is suspended 3 metres above the working plane. Calculate (i) Illumination directly below the lamp at the working plane. (ii) Lamp efficiency (iii) Illumination at point 2.5 metres away on the horizontal plane from vertically below the lamp. (08 Marks)

OR

- 4 a. Explain in detail, factors to be taken into consideration for design of lighting scheme. (06 Marks)
- b. A hall of 28m×48m is illuminated by indirect lighting using inverted bowl fittings. The average illumination of 108 lumens/m² is to be provided on horizontal plane parallel to the floor and 0.75 m above it. Design a suitable lighting scheme using filament lamps by taking utilization and maintenance factor as 0.4 and 0.85. Assume 200 W lamp of 14.4 lumens/watt. (08 Marks)
- c. Explain the working of High pressure mercury vapour lamp with neat diagram. (06 Marks)

Module-3

- 5 a. Explain the typical speed time curve and differentiate according to distance travelled. (06 Marks)
- b. Assuming quadrilateral speed time curve, derive equations for, (i) Total distance travelled by the train between two stops and (ii) Velocity at the time of braking. (08 Marks)
- c. A train is required to run between two stations 1.6 km apart at an schedule speed of 40 kmph. The run is made to a simplified trapezoidal speed time curve. Find the maximum speed over the run. If the stop is of 20 s duration. The values of acceleration and retardation are 2.4 kmph/s and 3.2 kmph/s. (06 Marks)

OR

- 6 a. Explain the parallel and series operation of series motors with unequal wheel diameters. (06 Marks)
- b. Briefly explain shunt transition and bridge transition for series parallel control of motors. (08 Marks)
- c. A motor coach bogie having two series motors is accelerated uniformly to a speed of 48 kmph in 30 sec with the help of series parallel controller. If the average tractive effort / motor is 13350 N. Calculate the approximate loss of energy in the starting rheostats. (06 Marks)

Module-4

- 7 a. Describe the methods employed in DC motors for electric braking. (06 Marks)
- b. With neat diagrams, explain Regenerative braking with DC motors. (08 Marks)
- c. A 500 V series traction motor has the following characteristics:

Current (A)	52	72	82	92
Speed (kmph)	33.9	26.0	24.6	23.1
Torque (N-m)	210	342	429	498

What will be the braking torque at a speed of 26 kmph when operating as a self excited series generator, the resistance of the braking rheostat being 50 Ω and that of the motor being 0.5 Ω . (06 Marks)

OR

- 8 a. Sketch and explain the arrangements of current collection used in electric traction,
 (i) Trolley wire section.
 (ii) Bow collector
 (iii) Current collecting shoe. (06 Marks)
- b. With neat diagram, explain duplication of Railway transmission lines. (08 Marks)
- c. Explain (i) Tramways (ii) Trolley bus. (06 Marks)

Module-5

- 9 a. Briefly explain modern electric drive train with a neat diagram. (08 Marks)
- b. Explain the traction motor characteristic for a electric vehicle. (06 Marks)
- c. How is vehicle energy consumption evaluated? (06 Marks)

OR

- 10 a. With a neat block diagram, explain the various architectures of hybrid electric drive trains. (08 Marks)
- b. Explain series hybrid electric drive trains with a block diagram. (06 Marks)
- c. Write short note on parallel hybrid electric drive trains. (06 Marks)

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