

CBCS SCHEME

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15EE742

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020

Utilization of Electrical Power

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. With a neat sketch, explain the construction, working principle of Ajax Wyatt furnace. (06 Marks)
- b. Explain with a neat sketch, how the spot welding is carried out by a Spot welding machine. (04 Marks)
- c. A 45 KW, 3 phase, 415V resistance oven employs a nichrome strip of thickness 0.25mm for a 3-phase star connected heating elements. If the wire temperature is to be 1200°C and that of the charge to be 800°C, estimate the length and width of the strip. Assume radiating efficiency of 0.57 and emissivity of 0.9. The specific resistance of nichrome is $1.03 \times 10^{-6} \Omega - m$. (06 Marks)

OR

- 2 a. State Faraday's laws of Electrolysis and explain:
i) Current efficiency ii) Energy efficiency. (06 Marks)
- b. How much aluminum will be produced from aluminum oxide in 24 hrs if the average current is 3,500A and the current efficiency is 90 percent? Aluminum is Trivalent and its atomic weight is 27. The chemical equivalent of silver is 107.98 and 0.00111gm of silver is deposited by one Coulomb. (04 Marks)
- c. A circular shaft of a diameter 12cm and 24cm long is to be coated with a layer of 1.6mm nickel. The current density is 200 A/m² and current efficiency is 95%. The specific gravity of nickel is 8.9 and its E.C.E is 1.0954 kg per 1,000 Ah. Determine the quantity of electricity required in Ah and time taken for the process in hours. (06 Marks)

Module-2

- 3 a. Two lamp posts are 20m apart and are fitted with lamps of luminous intensity 200 C.P. each at a height of 6m above the ground. Calculate the illumination on the ground i) under each lamp ii) midway between the lamps. (06 Marks)
- b. Define i) Luminous Flux ii) Luminous intensity iii) Illumination iv) Brightness v) Reduction factor vi) Coefficient of utilization. (06 Marks)
- c. Explain the working of fluorescent lamp with neat circuit diagram. (04 Marks)

OR

- 4 a. A workshop measuring 30 × 12m is to be provided with an illumination of 100 Lux on the working plane. The coefficient of utilization is 0.4 and the maintenance factor is 0.8 and the luminous efficiency of the lamps is 14 lumens per Watt. Calculate the number of lamps required and their deposition. (06 Marks)
- b. With a neat figure, explain the construction and working principle of sodium vapour discharge lamp. (05 Marks)
- c. i) What are the general requirements of factory lighting?
ii) What is flood lighting? (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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Module-3

- 5 a. Derive an expression for the specific energy output. (06 Marks)
- b. An electric train is accelerated from rest to a speed of 60 kmph in 30 seconds. The power is cut off and then the train coasts for 75 seconds against a constant resistance of 50 N/tonne and then braked to rest at 4 kmphs in 15 seconds. Calculate the schedule speed, if the duration of station stops is 30 seconds. Allow 10% for rotational inertia. If the stations stop is reduced to 10 seconds, what is the new schedule speed? (06 Marks)
- c. What are the advantage and disadvantages of Electric Traction? (04 Marks)

OR

- 6 a. Derive an expression for the tractive effort in terms of the weight of the train, acceleration, gradient and train resistance. (06 Marks)
- b. Define Specific Energy consumption and explain the various factors on which it depends. (06 Marks)
- c. Explain with the help of suitable circuit diagrams :
i) Shunt transition ii) Bridge transition as applied to a pair of d.c. traction motors. (04 Marks)

Module-4

- 7 a. Describe how plugging, rheostatic braking and regenerative braking are employed with d.c motors. (06 Marks)
- b. Discuss Mechanical braking arrangements used in electric traction. (04 Marks)
- c. A 525 – V series traction motor has the following characteristics :

Current (A)	50	70	80	90
Speed (Kmph)	33.8	26.9	25.1	23.8
Torque (N – m)	216	344	422	500

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 5.5 ohms and that of the motor being 0.5Ω? (06 Marks)

OR

- 8 a. Show how sag and tension are calculated in trolley wires. (06 Marks)
- b. Explain the function of a negative booster in a tramway system. (06 Marks)
- c. Sketch and explain the following arrangements of current collection used in electric traction:
i) Trolley – wire section ii) The bow collector iii) Current collecting shoe
iv) Collector wheel and Trolley - wire. (04 Marks)

Module-5

- 9 a. Explain with neat diagram the concept of series Hybrid Electric Drive trains. (06 Marks)
- b. Explain General Electric vehicle configuration with block diagram. (06 Marks)
- c. Explain Traction Motor characteristics of Electric vehicles. (04 Marks)

OR

- 10 a. Explain the concept of energy consumption of Electric vehicles using suitable equations. (06 Marks)
- b. Explain the concept of Hybrid Electric drive trains. (04 Marks)
- c. Explain with a neat diagram, the concept of Speed – Coupling Parallel Hybrid Electric Drive trains. (06 Marks)

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