

R16

Code No: 138FB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year II Semester Examinations, July - 2023

**UTILIZATION OF ELECTRIC POWER
(Electrical and Electronics Engineering)**

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

- 1.a) Classify electric loads based on torque. Mention their industrial applications. [2]
- b) Distinguish between continuous, intermittent, and variable loads. [3]
- c) List the properties of good heating element. [2]
- d) Give a comparison between AC and DC welding. [3]
- e) Define following terms: (i) Luminous Flux and (ii) Luminous intensity. [2]
- f) List the advantages of fluorescent tube lamps. [3]
- g) Distinguish between Coasting period and braking period in Speed – time curve. [2]
- h) Explain the significance of Speed-Time curves for train movement. [3]
- i) Define Dead weight and Accelerating weight. [2]
- j) What is coefficient of adhesion? Explain significance of term coefficient of adhesion. [3]

PART – B

(50 Marks)

- 2.a) Explain what do you mean by 'Individual drive' and 'Group drive'. Discuss their relative merits and demerits.
- b) Explain the significance of heating and cooling curves of Electrical Machines used in Electric Drives. Explain why cooling time constant is usually greater than heating time constant. [5+5]

OR

- 3.a) Explain the term 'Load Equalization' and explain its significance and role in Electric drives.
- b) A series motor takes 20 A at 400 V to drive a fan at 200 rpm. Its resistance is 1 Ohm (field and armature). If the torque required to drive the fan varies as the square of the speed, find the necessary applied voltage and current to drive the fan at 300 rpm. [5+5]

- 4.a) Explain the different methods of electric heating and give an example of each type.
- b) Explain in detail about butt welding and Flash welding. [5+5]

OR

- 5.a) What is Dielectric heating? Explain the principle of dielectric heating. Give its advantages and Applications.
- b) Explain the working of Ajax Wyatt vertical core furnace with a neat sketch. [5+5]

- 6.a) What is an integrating sphere? Explain its use in illumination engineering.
- b) A hall 30 m long and 15 m wide with a ceiling height of 5 m is to be provided with a general illumination of 120 lumens per m^2 . Taking a coefficient of utilization of 0.5 and depreciation factor of 1.42, determine the number of fluorescent tubes required, their spacing, mounting height and total wattage. The luminous efficiency of fluorescent tube as 40 lumen per watt for 80 W tube. [5+5]

OR

- 7.a) Prove that in a filament lamp the diameter of the filament is directly proportional to $I^{2/3}$, where I is the current flowing in the filament.
- b) A light is placed 4.5 m above the ground and its candle power is $200 \cos \theta$ in any downward direction making an angle θ with the vertical. If A and B are two points on the ground, 'A' being vertically under the light and the distance between A and B being 4.5 m, calculate (i) the illumination of the ground at A and also at B (ii) the total radiation sent down by the lamp. [5+5]

- 8.a) What are different systems of track electrification. Discuss merits and demerits of track electrification.
- b) For a trapezoidal speed time curve of an electric train, derive expression for maximum speed. [5+5]

OR

- 9.a) Discuss the main features of various train services. What type of train services corresponds to trapezoidal and quadrilateral speed time curves?
- b) The speed-time curve of a train consists of (i) Uniform acceleration of 5 km/hr/s for 26 seconds; (ii) free running for 9 minutes; (iii) Uniform deceleration of 5 km/hr/s to stop the train; (iv) A stop of 4 minutes. Find the distance between stations, the average, and scheduled speeds. [5+5]

- 10.a) Describe the procedure for calculating specific energy consumption of an electric train.
- b) A 750-tonne goods train is to be hauled by a locomotive up a gradient of 3% with an acceleration of 2.0 km/h/s. Coefficient of adhesion is 15 %, track resistance 60 N/tonne and effecting rotating masses 15 % of dead weight. Find the weight of the locomotive and number of axles if the axle load is not to exceed 20 tonnes. [5+5]

OR

- 11.a) Derive the expression for specific energy output from the driving axles using a simplified speed time curve. Assume the necessary initial conditions.
- b) Derive an expression for the tractive effort developed by a train unit. [5+5]

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