

(3 Hours)

[Total Marks : 80]

- N.B. :** (1) Question No.1 is compulsory.
(2) Attempt any Three questions out of remaining Five questions.
(3) Assume suitable data if necessary and justify the same.

1. Answer the following questions : 20
- (a) Explain the high frequency method of heat transfer along with its applications.
 - (b) Define and explain briefly the luminous intensity, intensity of illumination, co-efficient of utilization and depreciation factor.
 - (c) Explain the laws of illumination and its applications.
 - (d) Write the advantages of ac traction over dc traction systems.
2. (a) Derive an expression for the maximum speed V_m in terms of Distance D , Time of run, α and β for trapezoidal speed time curve. 10
- (b) Draw and explain vapour compression and vapour absorption cycles. Compare their features. 10
3. (a) Compare the features of electric vehicles and hybrid electric vehicles. Draw and show the series, parallel and series-parallel configuration of hybrid vehicles. 10
- (b) Discuss the bridge transition and shunt transition method of speed control of motors. State the advantages of one over the other. 10
4. (a) What are the factors to be considered for a good illumination system? What are the different methods of lighting design? A building measuring 30 mt x 20 mt is to be floodlit on the front side with brightness of 25 lumens/sq mt. Lamps of 500W having lumens output of 8000 each are used. Assuming utilization as 0.6, MF as 0.75 and depreciation factor as 1.2, design the lighting system. 10
- (b) Explain the working principle of fluorescent lamps. What are the different types and sizes available in the market? 10

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- 5. (a) With neat diagrams, explain Reflection, Refraction, Diffusion and Absorption type light control with examples for each type. 10
- (b) Derive an expression for the specific energy consumption from first principles (tractive effort required and tractive effort produced). 10
- 6. (a) A goods train weighing 300 tonnes is to be hauled by a locomotive up a gradient of 2% with an acceleration of 1 kmphs. Assume a co-efficient of adhesion of 20%, track resistance of 45 newtons/tonne and effective rotating masses of 10% of dead weight. If axle load is not to exceed 20 tonnes, determine the weight of locomotive and the number of axles. Also explain the importance and factors of coefficient of adhesion in traction. 10
- (b) Explain the working principle of Mercury Vapour Lamp and mention its applications. 10