Duration – 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.

Q 1. Answer the following questions. **20**

a) Draw typical speed time curve of a train running on main line and explain five distinct periods.

b) Write short note on different accessories for track electrification.

c) What are the methods of power factor improvement?

d) Explain the suitability of DC series motor for traction.

Q 2 a) What are the different types of track electrification? **10**

Q 2 b) Derive expression for most economical power factor improvement with usual notations. **10**

Q 3 a) Analyze the Quadrilateral speed time characteristics and derive an expression for the distance in terms of V_1, V_2, α, β **10**

Q 3 b) Draw and Explain the speed control method of DC Motors. **10**

Q 4 a) A 100-ton weight train has a rotational inertia of 10%. This train has to be run between two stations that are 3 km a part and has an average speed of 50 km/hr. The acceleration and the retardation during braking are 2 kmphps and 3kmphps, respectively. The percentage gradient between these two stations is 1% and the train is to move up the incline the track resistance is 50 N/ton, then determine: **10**

1. Maximum power at the driving axle.
2. Total energy consumption.
3. Specific energy consumption.

The combined efficiency of the alembic train is 70%. Assume simplified trapezoidal speed–time curve

Q 4 b) State necessity of railway signaling & Explain traction SCADA. **10**

Q 5 a) What are the terminologies used for refrigeration? Describe vapour absorption system in detail. **10**

Q 5 b) What is feeding post and feeding & sectioning arrangement in traction system? **10**

Q 6 a) With a neat diagram explain Vertical Core type induction furnace and state advantages of it. **10**

Q 6 b) Draw a neat diagram of spot welding machine and explain its working & Give application of resistance welding **10**

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