

(Three Hours)

(80 Marks)

- 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) Classify and explain the different types of track electrification.
 B) What is PF? Define and justify the advantages of improvement in PF.
 C) What are the different techniques of railway signaling systems.
 D) Draw a neat diagram and explain the vapor compression refrigeration cycle.
- Q 2 a) Derive an expression for the maximum speed in trapezoidal speed time curve and write application of this method. 10
- Q 2 b) Illustrate various power frequency heating methods in detail along with their applications. 10
- Q 3 a) Write a detailed note on PWM technique used for controlling the speed of Induction motor. Draw and explain the characteristic to show the speed variation of train using V/f control with respect to different torque/power regions. 10
- Q 3 b) A train runs with average speed of 40kmph. Distance between the stations is 2km. values of acceleration and retardation are 1.5kmphps and 2. 5kmphps respectively. Find the max speed of train assuming trapezoidal speed time curve. 10
 Describe the concept of regenerative braking. Justify why regenerative braking is not possible in DC series motor.
- Q 4 a) A 200-ton motor coach having 4 motors each developing 6000N.M torque during acceleration starts from rest. If up gradient is 30 in 1000, gear ratio 4, gear transmission efficiency is 90%, wheel radius is 45cm, train resistance is 50 n/t, calculate the time taken to attain the speed of 50kmph. Consider rotational inertia as 10%. Also find the current drawn per motor if the motor efficiency is 85% and line voltage is 3000V DC. 10
- Q 4 b) Derive an expression to find the most economical PF. 10
- Q 5 a) Illustrate the different methods of resistance welding with application of each method. 10
- Q 5 b) Write a detailed note on Overhead equipment used for traction. 10
- Q 6 a) Draw a neat block diagram of Traction SCADA and explain each block. 10
- Q 6 b) A 400V, 50Hz, 3 phase line delivers 200KW at 0.8PF lagging. It is desired to improve PF to unity by installing shunt capacitors. Calculate the capacitance if they are connected in star and in delta. Comment upon the values. 10