



C09-EE-605 B

**3767**

**BOARD DIPLOMA EXAMINATION, (C-09)**  
**MARCH/APRIL—2014**  
**DEEE—SIXTH SEMESTER EXAMINATION**  
**ELECTRIC TRACTION AND PLC**

*Time* : 3 hours ]

[ *Total Marks* : 80

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**PART—A**

3×10=30

**Instructions** : (1) Answer **all** questions.

(2) Each question carries **three** marks.

1. Write a brief note on 1-phase track electrification system.
2. Define maximum speed, schedule speed and average speed.
3. Distinguish among urban, sub-urban and mainline service with a neat diagram.
4. Define coefficient of adhesion.
5. Give the purpose and materials used for droppers and trolley wires.
6. Give the electrical characteristics of traction motor.
7. Define programmable logic controllers.
8. Write a short note on limit switch.
9. Define actuators.
10. Give the difference between inductive proximity switch and capacitive proximity switch.

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**PART—B**

10×5=50

**Instructions** : (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

- 11.** The average speed of an electric train between two stops is 2.5 km apart is 50 kmph. The acceleration and retardation are 2 kmphps and 3 kmphps. Assume trapezoidal speed-time curve. Find maximum speed and distance travelled before brakes are applied. Draw the speed-time curve.
- 12.** An electric train weighing 325 tonne is accelerated uniformly from rest to a speed of 48 kmph in 20 sec up a gradient of 1 in 100. Calculate the tractive effort, if the resistance is 52 N/tonne, rotational inertia being 10% of dead weight.
- 13.** (a) Define specific energy consumption. What are the factors affecting it? 5  
(b) State the methods of improving the coefficient of adhesion. 5
- 14.** An electrical train weighing 200 tonne has a rotational inertia of 12%. The train runs between two stations which are 3 km apart. It has an average speed of 45 kmph. The acceleration and retardation are 1.5 kmphps and 2.5 kmphps respectively. The percentage up a gradient is 2%. The track resistance and overall efficiency are 50 N/tonne and 85% respectively. Estimate (a) maximum power at the driving axle, (b) energy consumption and (c) specific energy consumption.
- 15.** Explain the suitability of AC 1-phase series motor, AC 3-phase induction motor and DC series motor.
- 16.** (a) Draw the ladder diagram of DOL starter. 5  
(b) Explain different parts of PLC. 5
- 17.** (a) Draw the ladder diagram of a water level controller. 5  
(b) Write the RS-232 specifications and electrical characteristics. 5
- 18.** (a) Classify the instruction sets of PLC. 5  
(b) Give the softwares used in the SCADA. 5

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