



C09-EE-605 B

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**BOARD DIPLOMA EXAMINATION, (C-09)
APRIL/MAY—2015
DEEE—SIXTH SEMESTER EXAMINATION**

ELECTRIC TRACTION AND PLC

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

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

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

1. State the advantages of AC to DC traction over other traction systems.
2. List the factors affecting the specific energy consumption.
3. State the importance of speed-time characteristics.
4. Write the advantages and disadvantages of end-on generation.
5. Define coefficient of adhesion.
6. State the need of booster transformer in electric traction.
7. State the applications of PLC.
8. List the input and output devices used with PLCs.
9. Define SCADA.
10. State the purpose of proximity switches.

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PART—B

10×5=50

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

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

- 11.** Derive the expression for tractive effort during (a) acceleration period, (b) free running and (c) up-gradient. 10
- 12.** (a) Explain the electrical and mechanical characteristics of traction motors. 5
(b) Derive the equation of maximum speed with trapezoidal speed-time curve. 5
- 13.** The average speed of an electric train between the two stops of 2.5 km apart is 50 kmph. The acceleration and retardation are 1.5 kmphs and 2.4 kmphs. Assume trapezoidal speed time characteristics. Find the maximum speed and the distance travelled before the brakes are applied. Draw the speed-time curve. 10
- 14.** Find the specific energy consumption of a 250 tonne electric train with 10% rotational inertia. The train reaches a maximum speed of 50 kmph in 25 seconds on level track. The distance between the stations is 2.4 km. The acceleration and retardation are 2 kmphs and 3 kmphs respectively. Assume the track resistance is 49 N/T and the efficiency of the motors is 90%. 10
- 15.** (a) Explain the block diagram of PLC. 5
(b) Explain counters (i) CTU and (ii) CTD commands. 5
- 16.** (a) Draw the ladder diagrams for NAND and NOR gates. 5
(b) Explain timers T-on, T-off and retentive timer. 5
- 17.** Explain the ladder diagrams for (a) star-delta starter and (b) temperature controller. 5+5=10
- 18.** Write short notes on (a) bow collector and (b) booster transformer. 5+5=10
