



C09-EE-605 B

3767

BOARD DIPLOMA EXAMINATION, (C-09)

OCT/NOV—2014

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. Define (a) average speed and (b) maximum speed.
2. State the importance of speed-time curve.
3. Write a short note on tractive effort to overcome acceleration.
4. Define coefficient of adhesion.
5. Define specific energy consumption and state its units.
6. State any three advantages of pantograph collector.
7. List six output devices used in PLC.
8. Draw the block diagram of PLC.
9. List the advantages of PLC.
10. Draw the ladder diagram of OR gate.

PART—B

10×5=50

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

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

- 11.** A train is required to run between two stations 1.6 km apart at an average speed of 40 kmph. The run is to be made to a simplified quadrilateral speed-time curve. If the maximum speed is to be limited to 64 kmph, acceleration to 2 kmphs and coasting and braking retardation to 0.16 kmphs and 3.2 kmphs respectively, determine the (a) actual time of run, (b) duration of acceleration, (c) duration of coasting period, (d) duration of braking period and (e) speed at the end of coasting period. 2×5=10
- 12.** A 200-tonne motor coach having 4 motors, each developing 6000 N-m torque during acceleration starts from rest. If the up gradient is 30 in 1000, gear ratio 4, gear transmission efficiency 90%, wheel radius 45 cm, train resistance 50 N/tonne, effect of rotational inertia 10%, calculate the time taken to attain a speed of 50 kmph. If the line voltage is 3000 volts d.c. and efficiency of motors 85%, find the current drawn by each motor during notching period. 10
- 13.** (a) State the factors affecting specific energy consumption. 4
- (b) A 300-tonne electric train is started with a uniform acceleration reaches a speed of 40 kmph in 24 seconds on a level track. Assuming trapezoidal speed-time curve, find the specific energy consumption, if rotational inertia is 8%, retardation 3 kmphs, distance between stops is 3 km, motor efficiency is 90% and train resistance is 49 N/tonne. 6
- 14.** (a) Explain end-on and mid-on generations in electric traction. 5
- (b) Explain the necessity of booster transformer in electric traction. 5

- * 15. Explain different current collectors used in electric traction. 10
16. (a) Explain the timer-on delay and timer-off delay instructions used in PLC. 5
(b) List the data handling instructions. 5
17. (a) Draw the ladder diagram of staircase wiring. 5
(b) Distinguish between Inductive and Capacitive proximity switches. 5
18. Write short notes on the following : 5×2=10
(a) Actuators
(b) SCADA

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