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BOARD DIPLOMA EXAMINATION, (C–09)

MARCH/APRIL—2018

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.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Classify the supply system of electrification.

2. Draw the speed-time curve of main line service.

3. List the factors affecting the schedule speed.

4. State the methods of improving the coefficient of adhesion.

5. Define specific energy consumption and specific energy output.

6. List the major parts of electric locomotive.

7. State the four advantages of PLC.

8. What is ladder logic diagram?

9. Define proximity switch and give its types.

10. Write about rotary encoder.

PART—B

10×5=50

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

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

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. *(a)* Define scheduled speed. List the factors affecting scheduled speed. 5

(b) An electric train has an average speed of 40 kmph. The acceleration and retardation are 1·5 kmphps and 2·5 kmphps respectively between two stops of 2 km apart. Find the maximum speed. Assume trapezoidal speed-time curve. 5

12. *(a)* Define tractive effort. 3

(b) Explain the mechanics of transfer of power from motor to driving wheel.

13. A 400 tonne goods train is to be hauled by a locomotive up a gradient of 2% with an acceleration of 1 kmphps. Coefficient of adhesion is 20%, track resistance is 40 N/tonne and effort of rotational masses is 10% of dead weight. Find the weight of the locomotive and number of axles if axle load is not to increase beyond 22 tonnes.

14. An electric train weighing 100 tonnes has a rotational inertia of 10%. This train while running between two stations which are 2·5 km apart has an average speed of 50 km/hr. The acceleration and retardation during braking are 1 kmphps and 2 kmphps respectively. The percentage gradient between these two stations is 1 and the train is to move up the incline. The track resistance is 40 N/tonne. If the combined efficiency of the electric train is 60%, determine—

(a) maximum power at the driving axle;

(b) total energy consumption;

(c) specific energy consumption.

Assume trapezoidal speed-time curve.

15. *(a)* Write a brief note on suitability of d.c. series motor for traction. 5

(b) Explain the purpose and material used for pantograph collector. 5

16. *(a)* Draw the block diagram of PLC. 5

(b) Write a short note on different memories used in PLC. 5

17. Explain about relay-type instructions.

18. Develop the Ladder diagram for AND, OR, NOT, NOR and NAND gates. 2+2+2+2+2=10

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