**3767**

**BOARD DIPLOMA EXAMINATION, (C–09)**

**MARCH/APRIL—2016**

**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.** State any three advantages of electric traction.

**2.** List the factors affecting the schedule speed.

**3.** What is the necessity of simplifying the actual speed time curve?

**4.** Define tractive effort and state its unit.                    2+1

**5.** List the factors affecting coefficient of adhesion.

**6.** Why can DC series motor be used for electric traction?

**7.** List six input devices used in PLC.

**8.** State any three applications of PLC.

**9.** What is PLC scan?

**10.** Draw the ladder diagram for AND gate.

**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. Describe various stages of speed-time curve for main line service with a neat sketch.

12. An electric train has quadrilateral speed-time curve as follows :

*(a)* Uniform acceleration from rest at 2 kmphps for 30 seconds

*(b)* Coasting for 50 seconds

*(c)* Uniform braking to rest for 20 seconds

*(d)* Duration of stops 30 seconds

If the train is moving a uniform up gradient of 10 in 100, train resistance being 40 N/tonne and rotational inertia effect 10% of dead weight, find the schedule speed.

13. An electric locomotive is required to haul a train of 12 coaches each weighing 30 tonnes on the main line service requiring an initial acceleration of 0·8 kmphphs up a gradient of 1 in 100. Estimate the adhesive weight and hence the number of driving axles the locomotive must have if the permissible axle loading is 20 tonnes per axle, assuming rotational inertia to be 4% for the coaches and 15% for the locomotive. Maximum coefficient of adhesion is 0·2 and tractive resistance is 5 kg/tonne.

14. It is proposed to run an eleciric trolley service in a city. The schedule speed is to be 45 kmph. The distance between stops is 2·8 km. The track is assumed to be level. Stop time is 30 seconds duration. Using simplified trapezoidal speed-time curve, calculate the maximum speed assuming acceleration of 2 kmphps and retardation 3·2 kmphps. The dead weight of car is 16 tonnes, rotational inertia is 10% of the dead weight and

track resistance is 40 N/tonne. If the overall efficiency is 80%, calculate—

(a) maximum power output from driving axles;

(b) specific energy consumption in Watt-hour/tonne-km.          5+5

**15.** Mention the purpose and material used for—

(a) catenary;

(b) droppers;

(c) trolley collector;

(d) bow collector;

(e) pantograph collector.                          2+2+2+2+2

**16.** (a) State any five rules for representing inputs and outputs in a ladder diagram.          5

(b) Draw the ladder diagram for DOL starter.          5

**17.** Write brief notes on the following :          5+5

(a) Memory of a PLC

(b) Rotary encoders

**18.** (a) Explain the features of SCADA.          5

(b) List the different SCADA softwares.          5

★ ★ ★