CE 131504 NR

Roll No. of candidate

1/3/2021

B.Tech. 5th Semester End-Term Examination

CE

TRANSPORTATION ENGINEERING – I

(New Regulation)

Full Marks – 70   Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the correct option: $(10 \times 1 = 10)$

    (i) The maximum length of wheel base of a vehicle as per IRC is

         (a) 4 m   (b) 6 m

         (c) 10 m   (d) 14 m

    (ii) The apparatus used for determination of flash and fire point of bitumen is known as

         (a) Briquette apparatus   (b) Pensky Martens apparatus

         (c) Both (a) and (b)   (d) None

    (iii) The highest point on a road surface is called

         (a) Crown   (b) Camber

         (c) Gradient   (d) Berm

    (iv) Traffic density is equal to

         (a) Speed X volume   (b) Volume/ speed

         (c) Both of the above   (d) None

    (v) The PCU for cars is

         (a) 1   (b) 0.5

         (c) 1.5   (d) 3.0

[Turn over

(vi) The binding material used in construction of the topmost surface of a pavement is

(a) Bitumen   (b) Fine sand

(c) Adhesive   (d) All of the above

(vii) The width of a single lane carriageway is

(a) 3.75 m   (b) 10.0 m

(c) 14.5 m   (d) 14.0 m

(viii) The raising of the outer edge of a curve with respect to the inner edge is known as

(a) Super elevation   (b) Camber

(c) Slope   (d) All of the above.

(ix) The impact test on road aggregates is performed in order to determine the

(a) Toughness   (b) Hardness

(c) Solubility   (d) None of the above

(x) The CBR value is evaluated at

(a) 2.5 mm penetration only   (b) 5.0 mm penetration only

(c) Both (a) and (b)   (d) None of the above

2. (a) Name the different stages of engineering surveys conducted before a highway alignment is finalised. Calculate the co-efficient of friction needed for a curve of radius 100 m. The design speed is 50 kmph and no super elevation is provided. (5)

(b) Calculate the safe stopping sight and intermediate sight distance on a highway at a descending gradient of 2% for a design speed of 80 kmph. Assume Total reaction time (t) = 2.5 seconds, g = 9.8 m/sec^2 and co-efficient of friction (f) = 0.35. (5)

(c) What do you mean by gradient of a road? Discuss various types of gradients depending upon steepness of the road. (2 + 3 = 5)

3. (a) Name the different methods adopted for Origin and Destination study. State any three applications of Origin and Destination study. (2 + 3 = 5)

(b) What are the significances of determining 85th percentile, 50th percentile and 98th percentile speed respectively? State the factors that are responsible for affecting the Passenger Car Unit (PCU). (5)

(c) What are the three categories of traffic signs as per the Indian Motor Vehicle Act? Mention any two regulatory signs as described by the Indian Motor Vehicle Act. (5)

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4. (a) Name any five tests of aggregates and bitumen for judging its suitability in pavement construction and specify the desirable values of the test results? (10)

   (b) The CBR load at 2.5 mm and 5.0 mm penetration are 64.6 kg and 91.2 kg respectively. Determine the CBR values at 2.5 mm and 5.0 mm. (5)

5. (a) The CBR value of a sub-grade soil is 5%. Calculate the thickness of the pavement if the corresponding wheel load is 4100 kg and tyre pressure is 6 kg/cm². (5)

   (b) Calculate the stresses at interior and corner region the following of a cement concrete pavement using the following data (10)

   Wheel load = 5100 kg

   Pavement thickness = 18 cm

   Radius of relative stiffness = 70.6 cm

   Equivalent radius of resisting section = 14 cm

   Radius of contact area = 15 cm

6. (a) What are the principal modes of failure in flexile pavements? Name them with detailed sketches. (10)

   (b) What is the principle of Overlay design in strengthening of existing pavement? Define Benkelman beam and its primary use? (2.5 + 2.5 = 5)

7. (a) Define: (4 × 1 = 4)

   (i) Carriageway

   (ii) Shoulders

   (iii) Traffic capacity

   (iv) Wearing course

   (b) Give a neat sketch of a flexible pavement and label the various cross sectional elements. (6)

   (c) Name the two methods of attainment of super elevation and give a neat sketch of each. (5)