CE 181504

Roll No. of candidate

2022

B.Tech. 5th Semester End-Term Examination

CE

TRANSPORTATION ENGINEERING – I

(New Regulation & New Syllabus)

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. Answer the following (MCQ) :   (10 × 1 = 10)

    (i)   As per the Nagpur plan, the un-surfaced roads were meant for:

          (a)   Other district road and village road

          (b)   Major district road

          (c)   State highway

          (d)   National highway

    (ii) The alignment of a road means:

          (a)   Its width

          (b)   Superelevation

          (c)   Camber

          (d)   Centre line on ground

    (iii) The rate of rise or fall of a road along its length is called:

          (a)   Slope   (b)   Ramp

          (c)   Curve   (d)   Camber

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(iv) Chemical used in soundness test of aggregate is:

(a) Na_2SO_4

(b) NaCl

(c) NA_3PO_4

(d) NaL

(v) The pavement width of a highway is decided by:

(a) Number of commercial vehicle

(b) Total PCUs on the highway

(c) Length of the largest vehicle

(d) Number of fast moving vehicles

(vi) The overlay thickness of highway pavement is decided by:

(a) Benkleman beam test

(b) PCU s on highway

(c) Number of slow moving vehicles

(d) Commercial vehicles in traffic stream

(vii) A road sign 'No Parking' is which type of sign:

(a) Warning sign

(b) Prohibitory sign

(c) Mandatory sign

(d) Informatory sign

(viii) The thickness of flexible pavement using IRC method is based on:

(a) Marshall test

(b) CBR test

(c) Impact test

(d) Hardness test

(ix) The curve provided to change the gradient is called:

(a) Horizontal curve

(b) Vertical curve

(c) Cross-slope

(d) Gradient

(x) In PIEV theory, 'P' stands for:

(a) Presence of mind

(b) Physiological treats

(c) Perception

(d) Practical

2. (a) Explain briefly the three important factors which control the design features of several geometrical elements of an ideal road. (5)

   (b) What do you understand by the term 'camber'? Why camber is provided and on what factors the camber of a road surface depends? How much camber will you recommend for the following roads: (10)

   (i) Cement Concrete

   (ii) Earth Road

   (iii) Water-bound Macadam Road.

3. (a) Write the three sight distance requirements in the design of a road/highway? Define stopping sight distance on vertical curves as per IRC:66-1976.

   Calculate the Stopping Sight Distance (SSD) for a design speed of 100 kmph. What are the sight distance requirements at a gradient of 1 in 40? Assume necessary data as recommended by IRC. (2+2+4=8)

   (b) What is centrifugal ratio? Write the two effects of centrifugal force which can act on a vehicle negotiating a horizontal road curve. How stability of a vehicle negotiating a horizontal curve depends more on the height of c.g of the vehicles above the road surface? (2+2+3=7)

4. (a) Define superelevation and why is it considered essential for modem traffic? Enumerate sequentially, the steps for practical design of superelevation for mixed traffic as per IRC. (2+2+6=10)

   (b) Write the necessity of widening of road on horizontal curves and grade compensation on horizontal curves. (5)

5. (a) What do you mean by 'traffic volume' and 'traffic capacity'? Explain briefly the 'floating car method' of travel time and flow studies. (7)

   (b) A two-lane single carriage way is to be designed for a design life period of 15 years. Total two-way traffic intensity in the year of completion of construction is expected to be 2000 commercial vehicles per day. Vehicle damage factor = 3.0, lave distribution factor = 0.75. Assuming an annual rate of traffic growth as 7.5%, find the design traffic expressed as cumulative number of standard axles. (8)

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6. (a) Classify the topography of the terrain based on cross-slope as per IRC:73-1980. (5)

(b) The specific gravities and weight proportions for aggregates and bitumen are as under for the preparation of Marshall moulds:

	Weight (gm)	Specific Gravity
Aggregate 1	825	2.63
Aggregate 2	1200	2.51
Aggregate 3	325	2.46
Aggregate 4	150	2.43
Bitumen	100	1.05

The volume and weight of one Marshall mould was found to be 475 cc and 1100 gm, assuming absorption of bitumen in aggregate is zero. Find

(i) percentage air voids (Vv)

(ii) percentage bitumen by volume (Vb)

(iii) percentage of voids in mineral aggregate (VMA)

(iv) percentage of voids filled bitumen (VFB) (10)

7. (a) A plate load test was conducted on a soaked sub grade during monsoon season using plate diameter of 40 cm. the load values corresponding to mean settlement are as given below.

Mean Settlement (mm)	Load Values (kg)
0	0
0.24	340
0.52	250
0.76	1130
1.02	1480
1.23	1524
1.53	1632
1.76	1748

Determine the modulus of sub-grade reaction for standard plate. (5)

(b) Differentiate between structural and functional failure of pavements. State the factors which would influence pavement distress in both flexible and rigid pavements. (10)

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