

B.E. Fourth Semester (Civil Engineering) (C.B.S.)
Transportation Engineering - I Paper – III

P. Pages : 2

Time : Three Hours



KNT/KW/16/7265

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) Explain the necessity and objectives of Highway planning. **6**
b) What are the various tests for judging the suitability of aggregates? Discuss any two tests in detail. **7**

OR

2. a) Briefly explain the engineering surveys needed for locating a new highway. **6**
b) A subgrade soil has the following characteristics **7**
i) Passing 425 micron = 90%
ii) Passing 75 micron = 62%
iii) Liquid limit = 49%
iv) Plastic limit = 21%
Find the group index of soil and its rating as a subgrade.

3. a) Explain camber? What are the objectives of camber? Discuss the factors on which the amount of camber to be provided. **7**
b) Calculate the extra widening required for a pavement of width 7 m on a horizontal curve of radius 240 m. If the longest wheel base of vehicle expected on the road is 7 m. Design speed is 65 kmph. **7**

OR

4. a) While aligning a highway in a built up area it was necessary to provide a horizontal circular curve of radius 325m. Design the following geometric features. **9**
i) Super elevation ii) Extra widening of pavement
iii) Length of transition curve, Data available are, Design speed = 65 kmph. Length of wheel base of largest truck = 6 m pavement width = 10.5 m.
b) Explain "PIEV" theory **5**

5. a) Explain 'Flexible and Rigid' Pavements and bring out the points of difference. **6**
b) Explain the factors affecting design of pavements. **7**

OR

6. a) Calculate the stresses at interior, edge and corner regions of a cement concrete pavements using Westergaard's stress equations. Use the following data. 8
 Wheel load = 5000 kg
 modulus of elasticity of cement concrete, $E = 3 \times 10^5 \text{ kg/cm}^2$
 Pavement thickness, $h = 18 \text{ cm}$
 Poisson's ratio of concrete $\mu = 0.15$ modulus of subgrade reaction, $k = 6.0 \text{ kg/cm}^3$
 Radius of contact area, $a = 15 \text{ cm}$.
- b) Write short notes on Joints in cement concrete pavement. 5
7. a) Explain the traffic-volume study in detail. 7
 b) Discuss the spot-speed study in detail. 6

OR

8. Write short note on **any three**. 13
 i) Penetration test on bitumen ii) Gradients.
 iii) PCU iv) 3 E's of traffic Engg.
 v) ESWL
9. a) Explain classification & numbering of bridges. 6
 b) The catchment area of a stream is of sandy soil with light vegetation cover and the area of the catchment is 12000 hectare. The length of the catchment is 25 km, and the fall in level from the critical point to the bridge site is 180 m. Calculate the peak runoff for designing the bridge. The rainfall in 4 hours is recorded 18 cm. Area factor = 0.70 and coefficient to account for losses due to absorption = 0.20. 8

OR

10. a) The approximate costs of one pier and one superstructure span for a multiple span bridge for various lengths of span are tabulated as follows. 7

Span in (m)	Cost of one pier (Rs)	Cost of one superstructure (Rs)
10	25000	7000
15	28000	13815
20	32500	31000
25	33700	36000
30	34800	41400

Determine economic span.

- b) Enumerate the various forces. Loads and stresses which are to be considered in the design of a bridge. 7
11. a) What are the substructures of a bridge? Mention the functions of each of them. 7
 b) Define the following 6
 Abutment, pier, Wing wall, cut water, Ease water, cofferdams.

OR

12. a) The normal velocity of flow in a river is 1.50 m/s. The normal waterway under the bridge, artificial waterway under the bridge and enlarged area upstream of the bridge are respectively. 8000 m^2 , 7000 m^2 , $10,000 \text{ m}^2$. Assume $g = 9.81 \text{ m/s}^2$ calculate the height of afflux and increase in velocity due to afflux. 7
 b) What is the necessity of maintenance of bridges? Explain. 6
