

Total No. of Questions : 8]

SEAT No. :

P-6524

[Total No. of Pages : 3

[6181]-73

**B.E. (Civil Engineering)**

**TRANSPORTATION ENGINEERING**

**(2019 Pattern) (Semester - VII) (401002)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume Suitable data, if necessary.*
- 5) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) What do you mean by formation width and carriageway width. Draw the typical cross section of road in hilly area. [6]
- b) Explain in brief how the superelevation is provided in the field. [6]
- c) A vertical summit curve is formed at the intersection of two gradients + 3% and – 5%. Design the length of the summit curve to provide a stopping sight distance for a design speed of 80 kmph. Assume any other data suitably. [6]

OR

- Q2)** a) Explain any two important pavement surface characteristics with respect to highway geometric design. [6]
- b) Design the rate of superelevation for a horizontal highway curve of radius 500m and speed 100 kmph. [6]
- c) What are the various vehicular characteristics which affects the road design? Briefly explain. [6]
- Q3)** a) What are the desirable properties of the sub grade soil? [6]
- b) Explain cutbacks and its types. What are its advantages over conventional bitumen? [6]
- c) Explain how Impact Test on aggregates is done in the laboratory. How are the results of the test interpreted? [6]

**P.T.O.**

OR

- Q4)** a) What is Foamed Bitumen? How foamed bitumen is prepared and where it is used. [6]  
b) Define 'flaky' aggregates. Explain the procedure for finding flakiness index in the laboratory. [6]  
c) Write a note on Crumbed Rubber Modified Bitumen. [6]
- Q5)** a) Draw a neat cross section of flexible pavement. Explain in brief functions of various layers of flexible pavement. [5]  
b) Explain maximum wheel load and contact pressure. [6]  
c) Compute the radius of relative stiffness of 15cm thick cement concrete slab from the following data : [6]

Modulus of elasticity of cement concrete = 210000 kg/cm<sup>2</sup>

Poisson's ratio for concrete = 0.13

Modulus of subgrade reaction,

K = i) 3.0 kg/cm<sup>3</sup> ii) 7.5 kg/cm<sup>3</sup>

OR

- Q6)** a) Explain with sketch equivalent single wheel load ESWL. [5]  
b) Calculate the stresses at interior regions of cement concrete pavement using Westergaard's stress equations. Use the following data : [6]  
Modulus of elasticity of cement concrete = 300000 kg/cm<sup>2</sup>  
Wheel load = 5100 kg  
Pavement thickness = 18 cm  
Poisson's ratio for concrete = 0.15  
Modulus of subgrade reaction = 6.0 kg/cm<sup>3</sup>  
Radius of contact area = 15 cm  
c) Explain the importance of dowel and tie bars in rigid pavements. [6]
- Q7)** a) Explain afflux. List and explain the different formulae used for estimation of afflux. [6]  
b) A bridge is proposed to be constructed across an alluvial stream carrying a discharge of 200 m<sup>3</sup>/sec. Assume Lacey's silt factor equal to 1.0. Find the maximum depth of scour when the bridge consists of 2 spans of 40 m each. [6]  
c) Explain the function of ballast. [5]

OR

- Q8)** a) Explain the following with a neat sketch : [6]
- i) Box Culvert.
  - ii) Swing bridge.
  - iii) Suspension bridge.
- b) A bridge has a linear waterway of 110m constructed across a stream, whose natural waterway is 190m. If the flood flow is 950 Cumecs and the mean depth of flow is 2.75m, Calculate the Afflux under the bridge. [6]
- c) Define Rail Guage and explain its types. [5]

