Total No. of Questions : 8]

SEAT No. :

PA-2672

[Total No. of Pages : 3

[5927]-329
B.E. (Civil)
TRANSPORTATION ENGINEERING
(2019 Pattern) (Semester - VII) (401002)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule, Molliers charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) The design speed of a highway is 90 kmph. There is horizontal curve of radius 200 m on a certain section. Allowable limit of lateral coefficient of friction is 0.15. **[10]**

i) Calculate the superelevation required to maintain this speed.

ii) If the maximum allowable superelevation is 7.0 percent, calculate the allowable speed on this horizontal curve.

b) Draw a neat cross section of **[6]**

VR in embankment and MDR in cutting in rural area: **[2]**

c) Define Camber?

OR

Q2) a) The ascending gradient of 2 per cent meets a descending gradient of 1 in 80. Determine the length of summit curve to provide **[10]**

i) SSD and

ii) OSD of 470 m, for design speed of 80 kmph. Assume all other data as per IRC guidelines.

b) Calculate the stopping sight distance on a highway at an ascending gradient of Two percent for a design speed of 60 kmph. Assume other data as per IRC recommendations? **[6]**

c) List the various types of transition curves used on horizontal curves of highways. **[2]**

P.T.O.

Q3) a) What are the different types of bituminous binders used in highway construction? Under what circumstances each of these materials is preferred? **[6]**

b) Define Flakiness Index (FI). How FI is determined in the laboratory. **[6]**

c) Write a note on Marshall method of bituminous mix design. **[5]**

OR

Q4) a) For a construction of a bituminous road in a certain locality, contractor has received 30/40 grade of bitumen from refinery. Explain in brief the test to be carried out to confirm the grade of the bitumen. **[6]**

b) Define Elongation Index (EI). How EI is determined in the laboratory. **[6]**

c) Explain in brief the importance of gradation of aggregates in design of bituminous and Non bituminous layer of flexible pavement. **[5]**

Q5) a) Using the following data calculate the wheel load stress at the edge region of a cement concrete pavement using H.M. Westergaards's equation:
Wheel load = 5100 kg, Modulus of Elasticity of concrete = 3×10^5 kg/cm^2, Pavement thickness = 15 cm, Poisson's ratio = 0.15, Modulus of subgrade reaction = 7.0 kg/cm^3, Radius of wheel load contact = 16 cm. **[8]**

b) Differentiate between warping stress and frictional stress in rigid pavement. **[6]**

c) Write a note on joints in cement concrete pavement. **[4]**

OR

Q6) a) A two lane two way road is carrying an initial traffic of 1600 Commercial Vehicles per day (CVPD) is to be strengthened to cater the need of growing traffic. The rate of growth of traffic is 8% per annum. The pavement is to be designed for 20 years. Calculate the VDF if pavement has to sustain cumulative standard axle load repetitions of 33.40 million during its design life. It is suggested to use the factor of 0.5 to account for lateral placement of wheel loads. **[8]**

b) What do you mean by pavement design? State the any five factors to be considered for the design of rigid pavement (explanation of factors is not required) **[6]**

c) Differentiate between flexible and rigid pavements. **[4]**

Q7) a) A bridge is proposed to be constructed across an alluvial stream carrying a discharge of 400 m^3 per second. Assume Lacey's silt factor equal to 1.5. Calculate the scour depth when

i) Bridge consists of Two spans of 40 m each

ii) Three spans of 35 m each. **[8]**

b) Define bridge. State the various components of bridge. **[4]**

c) State the various requirements of an ideal permanent way. **[5]**

OR

Q8) a) Define the following terms: **[8]**

i) Submersible bridge

ii) Skew bridge

iii) Class B bridge

iv) Through bridge

b) State the merits and demerits of railway transportation. **[4]**

c) State the various ideal bridge site characteristics. **[5]**