Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH.(CE)/SEM-6/CE-602/2012

2012

TRANSPORTATION ENGINEERING-I

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The motor vehicle act was enacted in

a) 1930 b) 1934

c) 1939 d) 1948.

ii) For the Water-bound macadam road, in localities of heavy rainfall, the recommended camber is

a) 1 in 40 b) 1 in 33

c) 1 in 25 d) 1 in 50 .

iii) The terrain may be classified as rolling terrain if the cross slope of land is

a) up to 10% b) between 10% and 20%

c) between 25% and 60% d) more than 60%

iv) As per IRC recommendation, the maximum limit of super elevation for mixed traffic in plain terrain is

a) 1 in 15 b) 1 in 12·5

c) 1 in 10 d) equal to the camber.

v) The mechanical extra widening required for 10·5 m wide pavement on a horizontal curve of radius R meter is

a) $L^2/(2R)$ b) $2L2/(3R)$

c) $L^2/(R)$ d) $3L^2/(2R)$.

vi) The sequence of four stages of survey in a highway alignment is

a) reconnaissance, map study, preliminary survey and detailed survey

b) map study, preliminary survey, reconnaissance and detailed survey

c) map study, reconnaissance, preliminary survey and detailed survey

d) preliminary survey, map study, reconnaissance and detailed survey.

vii) When the path travelled along the road surface is more than the circumferential movement of the wheels due to rotation, then it results in

a) slipping b) skidding

c) turning d) revolving.

viii) Camber in the road is provided for

a) effective drainage

b) counteracting the centrifugal force

c) having proper sight distance

d) none of these.

ix) On a single lane road with two way traffic, the minimum stopping sight distance is equal to

a) stopping distance

b) two times of the stopping distance

c) half of the stopping distance

d) three times of the stopping distance.

x) CBR test is a type of

a) Shear test

b) Bearing test

c) Penetration test

d) None of these.

xi) Right of way width is

a) Width of highway between the boundary lines of property abutting it

b) Width of bottom of embankment

c) Width of pavement

d) Width of crest.

xii) Abrasion test is carried out on aggregates to find

a) Hardness b) Toughness

c) Crushing strength d) Shear strength.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Briefly discuss the Engineering Surveys to be conducted for finalizing highway alignment and location.

3. Calculate the values of ruling minimum and absolute minimum radius of horizontal curve of a highway in plain terrain. Assume ruling design speed and maximum design speed as 100 and 80 kmph, and maximum super elevation e = 0·07 and transverse skid resistance f = 0·15.

4. Discuss the various factors affecting sight distance of a road.

5. Explain the difference between flexible and rigid pavement.

6. Describe the procedure in detail for determining the aggregate impact value of stone aggregate to be used for construction of road pavement.

7. What is the difference between Crocodile Cracking and ditch in Pavement ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) What are the factors on which stopping sight distance depends ? Explain briefly.

   b) Derive an expression for calculating the overtaking sight distance on a highway.

c) Calculate the safe stopping sight distance for design speed of 60 km/hr for

(i) two way traffic on a two lane road

(ii) two way traffic on a single plane road. 5 + 4 + 6

9. a) Discuss the desirable properties of bitumen. Compare tar and bitumen.

b) Explain briefly the penetration test and softening point test of bitumen. 3 + 3 + 9

10. a) State differences between flexible pavement and rigid pavement.

b) The design speed of highway is 80 km/hr. There is a horizontal curve of radius 200 m on a certain locality. Calculate the super elevation needed to maintain this speed. If the maximum super elevation of 0·07 is not to be exceeded, calculate maximum allowable speed on this horizontal curve as it is not possible to increase the radius. Safe limit of transverse co-efficient of friction is 0·15. 3 + 3 + 9

11. a) Write down the functions of soil sub-grade, base, sub-base course for flexible and rigid pavement.

b) Calculate the stresses at interior, edge and corner regions of cement concrete pavement using Westergaard's stress equations. Use the following data :
Wheel load, P = 5100 kg

Modulus of elasticity of cement

concrete, $E = 3 \times 105$ kg/cm^2

Pavement thickness, h = 20 cm

Poisson's ratio, $\mu = 0{\cdot}15$

Modulus of sub-grade reaction, K = 8 kg/ cm^2

Radius of concrete area, a = 15 cm 3 + 3 + 9

12. Write short notes on the following:

a) ESWL and Group Index Method of flexible pavement design

b) Plate bearing test and CBR test

c) Advantages and disadvantages of cement concrete and flexible pavements.