Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CE-NEW)/SEM-6/CE-602/2010

2010

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 radios R meter is

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

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

vi) The maximum width of the vehicle as per IRC recommendation is

a) 1·85 m b) 2·44 m

c) 3·81 m d) 4·72 m.

vii) Traffic volume is equal to

a) Traffic density ∞ Traffic speed

b) Traffic density / Traffic speed

c) Traffic speed / Traffic density

d) None of these.

viii) Dead slow is

a) regulatory sign b) warning sign

c) informatory sign d) none of these.

ix) In CBR test the value of CBR is calculated at

a) 2·5 mm penetration only

b) 5 mm penetration only

c) 7·5 mm penetration only

d) both 2·5 mm and 5 mm penetrations.

x) The maximum allowable Los Angles abrasion value for high quality surface course is

a) 10% b) 20%

c) 30% d) 45%.

xi) The maximum spacing of contraction joints in rigid pavement is

a) 2·5 m b) 3·5 m

c) 4·5 m d) 5·5 m.

xii) The thickness of bituminous carpet varies from

a) 20 mm to 25 mm

b) 50 mm to 75 mm

c) 70 mm to 100 mm

d) 100 mm to 120 mm.

xiii) The ductility value of bitumen for suitability in road construction should not be less than

a) 30 cm b) 40 cm

c) 50 cm d) 60 cm.

xiv) The most suitable equipment for compacting clayey soils

a) smooth wheel roller b) pneumatic tired roller

c) sheep foot roller d) vibrator.

xv) Which of the following represents the hardest grade of bitumen ?

a) 30 / 40 b) 60 / 70

c) 80 / 100 d) 100 / 120.

GROUP – B

(Short Answer Type Questions)

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

2. Discuss the factors on which camber depends.
3. Derive an expression for finding the stopping sight distance at level and grades.
4. Derive an equation for finding the super elevation required if the design coefficient of lateral friction is '*f*'.
5. Describe the procedure in detail for determining the aggregate impact value of stone aggregate to be used for construction of road pavement.
6. Explain the difference between flexible and rigid pavement.
7. What is semi rigid pavement ? What are the various factors to be considered in pavement design ?

GROUP – C

(Long Answer Type Questions)

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

8. Make economic analysis to determine which of the following road proposals is economically most viable

Element	***Life (Years)***	***Rate of Interest***	***Cost in Thousand Rupees***		
			Proposal X	***Proposal Y***	***Proposal Z***
Righ of way	200	5%	100	290	350
Grading	100	6%	200	250	400
Structure	100	8%	250	300	380
Pavement	20	8%	350	1850	1600

X, *Y* and *Z* are of lengths 21 km, 18 km and 16 km respectively. Average annual maintenance cost is Rs. 7000 per km.

Assume any other suitable data, if necessary.

9. a) State the object of – providing extra-widening of pavements on horizontal curves.

   b) Derive an expression for extra-widening on curves for 'n' traffic lanes.

   c) Find the total widening required for as four-lane highway on a horizontal curve of 270 m radius. Design speed of the road 80 kmph and length of wheel have is 6.1 m.

10. a) What is super elevation ? State its maximum and minimum value.

   b) Design the super elevation of a two lane road having design speed of horizontal curve is 420 m. Calculate the amount by which the outer edge is required to the raised with respect to inner edge.

   c) While aligning as hill road with as ruling gradient of 6, a horizontal curve of radius 60 m is encountered. Find the compensated gradient at the curve.

11. a) What are the different types of bituminous materials used in road construction ?

   b) Briefly discuss about different types of joints provided in cement concrete pavements.

   c) Specify different tests conducted in bituminous.

12. a) Write down the construction steps for WBM road.

    b) Briefly discuss about the compacting equipment used for construction of embankment.

13. Discuss various factors which are to be considered for pavement design.

14. a) Design the flexible pavement section by triaxial test method using the following data :

    Wheel load = 4100 kg

    Radius of contract area = 15 cm

    Traffic coefficient (X) = 1·5

    Rainfall coefficient (Y) = 0·9

    Design deflection = 0·25 cm

    E-value of sub grade soil Es = 100 kg / cm^2

    E-value of base course material Eb = 400 kg / cm^2

    E-value of 7·5 cm thick bituminous concrete surface course = 1000 kg / cm^2 .

    b) Write down the construction steps for Water Bound Macadam road. 7 + 8