HIGHWAY AND TRAFFIC ENGINEERING
(CIV2203)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Which of the following is not an element of geometrical design of highways
(a) Sight distance considerations (b) Intersection element
(c) Cross-section element (d) Highway alignment

(ii) The type of transition curve that is generally provided on a hill road is
(a) Circular (b) Cubic parabola
(c) Lemniscate (d) Spiral

(iii) Which of the below is not a type of force acting on the cement concrete pavement
(a) Environmental changes (b) Drying shrinkage
(c) Traffic load (d) Ductile load

(iv) What is the main design criterion for designing a rigid pavement
(a) Tensile stress (b) Compressive stress
(c) Fatigue stress (d) Shear stress

(v) The seepage flow is present in
(a) Surface drainage (b) Sub surface drainage
(c) Camber (d) Cross slope

(vi) The area surrounding a depression on the pavement surface is generally subjected to
(a) Potholes (b) Heaving
(c) Cracks (d) Rutting

(vii) Which of the following is not a reason for the failure of sub grade
(a) Inadequate stability (b) Lack of lateral confinement
(c) Inadequate drainage (d) Excessive stress application

(viii) Which of the following parking statistics is expressed by accumulation curve
(a) Parking accumulation (b) Parking volume
(c) Parking load (d) Parking turnover

(ix) If the angle of merging is low, then the relative speed will be
(a) Low (b) High
(c) Medium (d) Depends on width of pavement

(x) Which of the following is not a way by which traffic volume data is presented
(a) AADT (b) Variation charts
(c) Traffic composition (d) Modal average

Fill in the blanks with the correct word

(xi) The removal and diversion of surface water from the roadway is called _____

(xii) The structure provided on the pavement to remove the storm water is_____

(xiii) In water bound macadam roads, the binding material is_____

(xiv) The soaking period of CBR sample is _____

(xv) The critical stress is considered in _____

Group - B

2. (a) The speed of overtaking and overtaken vehicles are 70 and 40 kmph respectively, on a two way traffic road. If the acceleration of the overtaking vehicle is 0.99m/sec^2, then calculate safe overtaking sight distance. Also mention the minimum length of overtaking zone. *[(CO1) (Analyse/IOCQ)]*

(b) Write short notes on: (i) Traffic separators, (ii) Kerbs. *[(CO1) (Remember/LOCQ)]*

6 + (3 + 3) = 12

3. (a) Calculate the extra widening required for a pavement of within 7 m on horizontal curve of 250 m, if the longest wheel base of vehicle expected on the road is 7 m. Take design speed of 70 kmph. *[(CO1) (Apply /IOCQ)]*

(b) Explain the different types of transition curves used in highways. *[(CO1) (Remember/LOCQ)]*

8 + 4 = 12

Group - C

4. (a) What are the objectives of mix design for bitumen to be used on highways. *[(CO2) (Remember /lOCQ)]*

(b) Write a short note on Marshall Mix Design. *[(CO2) (Remember/LOCQ)]*

6 + 6 = 12

5. (a) Calculate the radius of relative stiffness of 25 cm thick cement concrete slab using the following data:
(i) Modulus of elasticity of cement concrete – 2.1×10^5 kg/cm^2.
(ii) Poisson's Ratio of concrete – 0.15
(iii) Load sustained by rigid plate – 2000kg. *[(CO3) (Apply/IOCQ)]*

(b) Write a short note on ESAL. *[(CO3) (Remember/LOCQ)]*

8 + 4 = 12

Group - D

6. (a) What are the objectives of expansion joints, contraction joints, warping joints and construction joints? *[(CO4) (Remember /LOCQ)]*

   (b) What are the requirements of joints filler and sealer? *[(CO4) (Remember/LOCQ)]*

8 + 4 = 12

7. (a) Explain the principle and uses of Benkelman Beam test. *[(CO4) (Understand/LOCQ)]*

   (b) Write short notes on: (i) Mud Pumping, (ii) Alligator Cracking. *[(CO4) (Remember/LOCQ)]*

6 + (2 × 3) = 12

Group - E

8. (a) Briefly explain the different vehicular characteristics which affect road design. *[(CO5) (Remember /LOCQ)]*

   (b) Explain spot speed, space-mean speed and time-mean speed. *[(CO5) (Remember/LOCQ)]*

6 + 6 = 12

9. (a) What are the advantages and disadvantages of traffic signal? *[(CO6) (Remember /LOCQ)]*

   (b) The 15 minutes traffic count on cross roads 1 and 2 during peak hour are observed as 178 and 142 vehicles per lane respectively approaching the intersection in the direction of heavier traffic flow. If the amber times required are 3 and 2 seconds respectively for two roads based on approach speeds, design the signal timings by trial cycle method. Assume an average time headway of 2.5 seconds during green phase. *[(CO6) (Create/HOCQ)]*

4 + 8 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	58.00	29.00	13.00