

**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 maximum superelevation on hill roads should not exceed
 - (a) 7%
 - (b) 8%
 - (c) 9%
 - (d) 10%
- (iii) Extra widening of pavements provided for off-tracking is known as
 - (a) Mechanical widening
 - (b) Psychological widening
 - (c) Frictional widening
 - (d) Physical widening
- (iv) The traffic load data is not helpful in determining which of the following parameter
 - (a) Pavement composition
 - (b) Pavement thickness
 - (c) Pavement layer type
 - (d) Number of pavement layers
- (v) What is the total thickness of the pavement
 - (a) Constant
 - (b) Changes with sub grade
 - (c) Changes with sub base
 - (d) Changes with base
- (vi) The seepage flow is present in
 - (a) Surface drainage
 - (b) Sub surface drainage
 - (c) Camber
 - (d) Cross slope
- (vii) When is it safe to cross at a zebra crossing
 - (a) When the traffic on both sides have slowed down
 - (b) When the traffic on one side has stopped
 - (c) When the traffic on both sides have stopped
 - (d) When the traffic on one side has slowed down

- (viii) An intersection that is provided for different levels of road is called
 (a) Intersection at grade (b) Grade separated intersection
 (c) Channelized intersection (d) Rotary intersection
- (ix) The PCU value near rotary is highest for
 (a) Car (b) Bus
 (c) Cycle (d) Animal drawn vehicles
- (x) Which of the following is considered a significant limitation of a traffic rotary?
 (a) High traffic capacity compared to other intersections
 (b) Need for large space which is costly in urban areas
 (c) Reduced conflict points for all traffic streams
 (d) High maintenance cost

Fill in the blanks with the correct word

- (xi) The _____ of any one of the component pavement layers can lead to the failure of the pavement.
- (xii) In water bound macadam roads, the binding material is _____
- (xiii) As per MORTH the specified compaction of density is _____
- (xiv) The critical stress is considered in _____
- (xv) Contraction joints can be used to regulate the _____ of cracks.

Group - B

2. (a) Mention all the factors that govern the geometric features of a highway and briefly explain any three of them. [[CO1] (Understand/LOCQ)]
 (b) What do you mean by Camber? What are the objectives of providing Camber? [[CO1] (Remember/LOCQ)]
 (c) With the help of neat sketches show the different shapes of Camber. [[CO1] (Understand/LOCQ)]
4 + (2 + 3) + 3 = 12
3. (a) Derive an equation for finding the superelevation required if the design coefficient of lateral friction is "f". [[CO1] (Create/HOCQ)]
 (b) Design the rate of superelevation for a horizontal curve of radius 500 m and speed 100 kmph. [[CO1] (Apply/IOCQ)]
6 + 6 = 12

Group - C

4. (a) Design the pavement for construction of a new bypass with the following data:
 (i) Two lane single carriage way
 (ii) Initial traffic in the year of completion of construction – 400 CVPD (including both directions)
 (iii) Traffic growth – 7.5%
 (iv) Design life – 15 years

- (v) Vehicle damage factor – 2.5 standard axle per commercial vehicle
 (vi) Design CBR of subgrade soil – 5%. [[CO3] (Apply/IOCQ)]
- (b) Write a short note on EWLF. [[CO3] (Remember/LOCQ)]
8 + 4 = 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 – $2.1 \times 10^5 \text{ kg/cm}^2$
 (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) What are the significance of highway drainage? [[CO4] (Remember /LOCQ)]
 (b) What are the requirements of highway drainage system? [[CO4] (Remember/LOCQ)]
6 + 6 = 12

Group - E

8. (a) Discuss briefly the various factors which affect the road user characteristics and their effects in traffic performance. [[CO5] (Understand /LOCQ)]
 (b) Explain origin and destination study. What are the various uses of O and D studies. [[CO5] (Remember/LOCQ)]
6 + (4 + 2) = 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	62.5	23	14.5

