

**HIGHWAY & TRAFFIC ENGINEERING
(CIVL 3103)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) For water bound macadam roads in localities of heavy rainfall, the recommended value of camber is
 (a) 1 in 30 (b) 1 in 36
 (c) 1 in 48 (d) 1 in 60.
- (ii) On a single lane road with two way traffic, the minimum stopping sight distance is equal to
 (a) Stopping distance (b) Two times the stopping distance
 (c) Half the stopping distance (d) Three times the stopping distance.
- (iii) As per IRC recommendations, the maximum limit of superelevation for mixed traffic in plain terrain is
 (a) 1 in 15 (b) 1 in 12.5
 (c) 1 in 10 (d) Equal to camber.
- (iv) Critical load position in a rigid pavement design is taken as
 (a) Interior loading (b) Edge loading
 (c) Corner loading (d) Interior, edge and corner loading.
- (v) The main function of prime coat is to
 (a) Provide bond between old and new surfacing
 (b) Improve riding quality of pavement
 (c) Provide bond between the existing base and surfacing of new construction
 (d) Control dust nuisance.
- (vi) Right hand curve is a
 (a) Warning Sign (b) Informatory Sign
 (c) Regulatory Sign (d) All of the above.

- (vii) Width of weaving section of a rotary should be between
 (a) 6m and 22m (b) 6m and 18m
 (c) 7m and 18m (d) 7m and 21m.
- (viii) Maximum no. of passenger cars that can pass a given point on a road during one hour under the prevailing roadway and traffic conditions is called
 (a) Possible capacity of traffic lane (b) Traffic density
 (c) Basic capacity of traffic lane (d) Traffic volume
- (ix) The traffic survey is conducted during
 (a) Harvest season (b) Harvest and lean season
 (c) Rainy season (d) Summer season.
- (x) The surface drainage does not consist of
 (a) Camber (b) Road side drains
 (c) Culvert (d) Curves.

Group - B

2. (a) Write down the recommendations of Jayakar Committee, 1927.
 (b) What do you mean by obligatory point?
 (c) The design speed of a particular road with a gradient of 1 in 40 is 65 kmph. Find stopping sight distance for ascending and descending gradient. Assume reaction time of driver $t = 2.5$ sec., co-efficient of friction $f = 0.36$.
3 + 2 + 7 = 12
3. (a) Write down the details to be collected during economic studies for planning of a highway.
 (b) What are the effects of improper alignment of a road?
 (c) A vertical summit curve is to be designed when two grades, +1/50 and -1/80 meet on a highway. The stopping sight distance (SSD) and overtaking sight distance (OSD) required are 180 m. and 640 m. respectively. But due to site conditions the length of vertical curve has to be restricted to a maximum value of 500 m., if possible. Calculate the length of summit curve needed to fulfil the requirements of i) SSD, ii) OSD or at least ISD.

3 + 2 + 7 = 12

Group - C

4. (a) Write short note on the following:
 (i) Base course of pavement (ii) Vehicle damage factor.

- (b) What is modified bituminous binders? Where is it used?
 (c) What is equivalent single wheel load? Explain with neat sketch.
(3 + 3) + 3 + 3 = 12

5. (a) What are the functions of bituminous binders as pavement material?
 (b) What is the basic principle of CBR method of flexible pavement design?
 (c) Determine the warping stress at interior, edge and corner of a 25 cm. thick cement concrete pavement with transverse joints at 5 m. interval and longitudinal joints at 3.6 m. interval. The modulus of subgrade reaction K is 6.9 kg/cm³ and radius of loaded area is 15 cm. Assume maximum temperature differential during day to be 0.6°C per cm. slab thickness (For warping stresses at interior and edge) and maximum temperature differential of 0.4°C per cm. slab thickness during the night (For warping stresses at corner). Additional data are given:
 Thermal co-efficient of concrete "e" = 10 x 10⁻⁶ per °C
 Modulus of elasticity of concrete "E" = 3 x 10⁵ kg/cm²
 Poisson's ratio of cement concrete "μ" = 0.15
 Use warping stress co-efficient chart.
3 + 2 + 7 = 12

Group - D

6. (a) What do you mean by an Embankment? Briefly discuss about the design elements that are taken into consideration for the design of highway Embankments?
 (b) Write short notes on the following:
 (i) Expansion joint (ii) Contraction joint (iii) Warping joint.
(2 + 4) + 6 = 12
7. (a) Indicate how the filter material is designed for use in sub-surface drainage system. Describe the different steps of construction of gravel roads.
 (b) Write short notes on: (i) alligator cracking and (ii) mud pumping.
(3 + 3) + (3 + 3) = 12

Group - E

8. (a) What do you mean by Practical Capacity of a traffic lane? What are the factors that influence the Practical Capacity of a traffic lane?

- (b) What are the advantages and disadvantages of a traffic signal? Write a short note on Origin and Destination study.
(2 + 4) + (3 + 3) = 12
9. (a) What are different causes of traffic accidents? What are the differences between on-street parking and off-street parking?
 (b) Briefly explain the different vehicular characteristics which affect road design.
(3 + 3) + 6 = 12