ADVANCED HIGHWAY AND TRAFFIC ENGINEERING
(CIVL 4146)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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)   Arterial roads have
   (a) More land access and less mobility
   (b) Less land access and more mobility
   (c) Almost balanced land access and mobility
   (d) None of these.

   (ii)   A driver with 6/6 vision can see a sign from a distance of 2.7 m if the letter size is 5 cm. How close would a person with 6/18 vision have to be to see the same sign?
   (a) 1.7 m   (b) 3.7 m   (c) 0.9 m   (d) 0.5 m

   (iii)   For safe geometric design purpose, it is assumed that the vehicles have break efficiency of
   (a) 100%   (b) 80%   (c) 30%   (d) 50%.

   (iv)   Headlight beam angle is taken as
   (a) 3°   (b) 1°   (c) 2°   (d) 5°

   (v)   Maximum weaving length for rotaries in rural areas as per IRC recommendation is
   (a) 90 m   (b) 60 m   (c) 45 m   (d) 30 m

   (vi)   The type of parking in which the vehicles are parked along the kerb is called _____
   (a) Kerb parking   (b) Off-street parking
   (c) Parallel parking   (d) Angle parking.

   (vii)   What is the full form of VMS?
   (a) Volume mean speed   (b) Variable message sign
   (c) Volume message sign   (d) Variable mean speed.

   (viii) IRC has specified the value of longitudinal friction in between
   (a) 0.5 to 0.7   (b) 0.3 to 0.5   (c) 0.25 to 0.35   (d) 0.35 to 0.4.

(ix)   Height of headlight beam is taken as
        (a) 1.2 m   (b) 0.15 m   (c) 0.75 m   (d) 1.5 m

(x)   Which technologies are used in ITS?
        (a) Communication technologies   (b) Artificial vision system
        (c) Digital mapping   (d) All of the above.

Group – B

2. (a)   Determine the following for a road on a horizontal curve of radius 500 m. Design speed is 100 kmph.
        (i) Superelevation, when full lateral friction comes into play.
        (ii) Coefficient of friction when no superelevation is provided.
        (iii) Superelevation (equilibrium) for pressure on inner and outer wheel to be equal (i.e. $f = 0$). [(CO2) (Evaluate/HOCQ)]

  (b)   Discuss about the factors affecting perception-reaction time of road users. [(CO1) (Understand/LOCQ)]

                                      6 + 6 = 12

3. A rising gradient of 1 in 25 meets with a falling gradient of 1 in 50 on a National Highway. Design a vertical curve if the existing features near the locality permit adoption of only minimum sight distance. [(CO2) (Evaluate/HOCQ)]

Speed (km/hr)	Acc. (m/sec²)
25	1.4
30	1.3
40	1.25
50	1.1
65	0.9
80	0.7
100	0.3

                                        12

Group – C

4. (a)   Briefly discuss about the various stages involved in location survey for a highway. [(CO3) (Understand/LOCQ)]

  (b)   What are the advantages and disadvantages of rotary intersections? [(CO3) (Understand/LOCQ

                                      8 + 4 = 12

5. (a)   Write short notes on the following soil classification system:
        (i) Compaction classification system.
        (ii) IS classification system. [(CO3) (Understand/LOCQ)]

  (b)   What are the various types of intersection that are required to provide? Discuss about the importance of channelization. [(CO3) (Understand/LOCQ)]

                              (3 + 3) + (2 + 4) = 12

Group – D

6. (a) Which vehicular characteristics are taken into consideration in traffic engineering? [(CO4) (Analyse/IOCQ)]
   (b) Define the terms: (i) Headway, (ii) Spacing and (iii) Delay.
       [(CO4) (Understand/LOCQ)]
   (c) What are the advantages of traffic signal? [(CO4) (Understand/LOCQ)]

   4 + 6 + 2 = 12

7. (a) What are the factors that affect the value of PCU? What are the factors affecting PCU? [(CO4) (Understand/LOCQ)]
   (b) Write a short note on Traffic Management techniques.
       [(CO5) (Understand/LOCQ)]

   (5 + 3) + 4 = 12

Group – E

8. (a) What do you mean by On-Street and Off-Street parking?
       [(CO5) (Understand/LOCQ)]
   (b) Show the various patterns of Kerb parking with neat sketches.
       [(CO5) (Apply/IOCQ)]

   2 + 10 = 12

9. Write short notes on the following:
   (i) Intelligent Transport System (ITS).
   (ii) Accident Studies. [(CO6) (Understand/LOCQ)]

   (6 + 6) = 12

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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	66.67%	13.33%	20%

Course Outcome (CO):
After the completion of the course students will be able to
1. Understand the geometric design policies, design control and factors affecting it.
2. Design the geometric elements of highway.
3. Understand highway location, alignment design, project preparation and design principles of intersection.
4. Conduct traffic studies, analyze traffic data and design traffic signals.
5. Analyze parking & accidents; understand traffic impacts, traffic management techniques.
6. Understand traffic management and intelligent transportation system.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission link:
CE & Sec A	https://classroom.google.com/c/NDA2MTY2NDg2NTgx/a/NDYzNjY5NDYyNDk3/details
CE & Sec B	https://classroom.google.com/c/NDA2MTY4MjUwNjY4/a/NDYzNjcyNTU1MTEy/details