Enrollment No. _____ Name of Student _____

Motilal Nehru National Institute of Technology, Allahabad
Department of Civil Engineering
B.Tech V Semester, Mid Term Exam (Odd semester 2017-18)

Course Code: CE-1502 **Course Name: Transportation Engineering-I**
Duration: 1.5 hours Date: 21/09/2017
Time: 10.30 am to 12.00 pm Max. Marks: 20

Read Instructions:

- ✓ **Assume suitable data and state it clearly.**
- ✓ **Answers should be brief and to the point.**
- ✓ **Attempt all questions in serial order and write all parts of a question at one place.**
- ✓ **Do not write anything on your question papers except your names and enrolment number.**

Q1. Write answers for the following: *Any two* **(2*2=4)**

a) Discuss the factors influencing highway capacity.
b) Discuss the factors influencing highway geometric design.
c) Draw and discuss the fundamental diagrams of traffic flow.
d) Discuss the various mandatory and obligatory points for highway alignment.

Q2. Differentiate between: **(4*1=4)**

a) Time headway and Space headway.
b) Capacity and Level of service
c) Overturning and Transverse skid
d) Ruling and Exceptional gradient

Q3. Short answers: *Any two* **(2*1=2)**

a) Curve Resistance
b) Setback distance
c) Creeper lane
d) 30th Hourly Volume

Q4. State *True* or *False* and *correct* the false statements. Justify your answers in either case: **(2*1=2)**

a) On divided highways with four or more lanes, OSD is not provided, but only SSD is sufficient.
b) In a Distance-Time diagram of vehicle trajectories, more line between two reference lines on x-axis indicates high density.

Q5. Numerical (*Any three*) **(3*2=6)**

(i) A car is travelling at a speed of 90 kmph. The brakes are applied to avoid a collision with an object that is 90 m away from the point when the driver applies the brakes. Determine
(i) For which of the given cases the car will collide with the object, and
(ii) The speed of car for all cases when it collides with the object.
(a) Level terrain. (b) Upgrade of 5% (c) Downgrade of 5%

(ii) Determine the length of the transition curve required for a horizontal curve on a two-lane two-way highway with a 360 m radius and 180m length in a built-up area. Also determine the distance to be kept clear from inside edge of inner lane to provide a sufficient SSD. Assume the design speed as 65 kmph.

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(iii) Four road links A, B, C and D are to be constructed under the NHDP project. Determine the order of priority for phasing the road construction. The utility units for the population are 0.5, 1.0, 3 and 5 and; 2, 3 and 5 units per 1000 t for agricultural, raw materials and industrial products. The negative effect of expenditure on truck transportation (on sections with slopes), required for supply of material for road construction is also to be considered for the utility analysis. Assume a factor of 5 units per Rs. 1000 spent on trucking.

Road link	Length (km)	No. of villages served w.r.t population rage				Productivity served, t			Length of gradient route travelled by trucks and its Grade	Cost of trucking per km of graded route
		<500	501-1000	1001-2000	>2000	Agricultural products	Raw materials	Industrial products		
A	55	30	15	10	3	4000	3000	1000	3 km for 6%	Rs. 600 for 6% grade
B	45	20	8	6	3	5000	1000	1600	4 km for 3%	Rs. 250 for 3% grade
C	50	15	6	5	5	6000	2000	3200	2.5 km for 8%	Rs. 700 for 8% grade
D	50	40	4	3	2	3000	7000	2000	5 km for 2.5%	Rs. 200 for 2.5% grade

0.5 1 3 5 2 3 5

(iv) Design a two-phase traffic signal for an intersection with four arms by Webster's method for the following data. Take all-red time for pedestrian crossing as 12 seconds.

	North	South	East	West
Design Hour Flow	600	400	590	460
Saturation Flow	1900	1500	2360	2000

Q6. Draw neat figures for the following: *Any One* **(2*1=2)**

a) All vehicular conflict points on a 2-lane 2-way 4-legged intersection.
b) One labelled example each for Prohibitory, Mandatory, Informatory and Cautionary Traffic Signs.

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