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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

TEST - 1

Even Semester: 2018-19

Course Code: CIV 206

Course Name: Transportation Engineering

Programme & Sem: B.Tech (CIV) & IV Sem

Date: 05 March 2019

Time: 1 Hour

Max Marks: 40

Weightage: 20%

Instructions:

- (i) Read the question properly and answer accordingly.
- (ii) The question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted.
- (iv) Assume all standard data if required.

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (3Qx4M=12)

1. The design speed on a road is 60 kmph. Assuming the driver reaction time of 2.5 seconds and the coefficient of friction of pavement surface as 0.35, calculate the required stopping distance for two-way traffic on a single lane road if the braking efficiency is 85 percent.
2. What are the objectives of providing extra widening?
3. Explain the function of camber, shoulder, and divider on a highway.

Part B

Answer **both** the Questions. **Each** question carries **eight** marks. (2Qx8M=16)

4. What is the maximum utility value? Three new roads X, Y, and Z are planned in a district. The data for these roads is given below-

Road	Length (km)	Number of villages with a population		
		>5000	2000-5000	<2000
X	25	8	6	12
Y	32	10	8	7
Z	28	12	6	4

Based on the principle of maximum utility, find the order of priority for these three roads.

5. Calculate the OSD and length of OSD zone for the undivided national highway having design speed 65 kmph and descending gradient 2.5 percent. Assume acceleration of overtaking vehicle is 2.5 kmph/sec.

Part C

Answer the Question. Question carries **twelve** marks.

(1Qx12M=12)

6. At a horizontal curve portion of two-lane (width 7.5m) national highway in hilly terrain, a transition curve is to be introduced to attain superelevation. The design speed is 70 kmph and radius of the curve is 180 m. Calculate the length of transition curve based upon
- (a) Comfort condition
 - (b) Rate of change of super elevation and extra widening (the pavement is rotated about inner edge)
 - (c) Empirical formula

4. Braking tests were conducted with a vehicle and the vehicle was stopped by applying brakes fully. Determine the average skid resistance if:
- Speed of vehicle at the time of brake application is 45 kmph and Skid marks were 10.5m in length
 - Vehicle stopped within 2.5 sec after application of brake and Initial speed of vehicle is 45 kmph
 - Vehicles stopped within 1.8sec and Skid marks observed was 8.0m long
- Also, find the braking efficiency for all the cases if the maximum skid resistance is 0.8

Part C

Answer the Question. The Question carries **twelve** marks.

(1Qx12M=12)

5. Design a summit curve for undivided 2 lane National Highway (Design speed = 50kmph) to satisfy SSD condition. The curve is to be provided when a rising gradient of 1 in 60 intersects a falling gradient of 1 in 40. Determine the R.L. of the point immediately below the intersection point of grade line and the R.L. of highest point on the curve if the R.L. of Point of vertical curvature (P.V.C.) = 125m.

Also compute the grade compensation if a horizontal curve of radius 150m is provided on the descending gradient at a considerable distance after the vertical curve.



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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Even Semester: 2018-19

Date: 22 May 2019

Course Code: CIV 206

Time: 3 Hours

Course Name: Transportation Engineering

Max Marks: 80

Program & Sem: B. Tech & IV Sem

Weightage: 40%

Instructions:

- (i) Read the question properly and answer accordingly.
- (ii) The question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer **Both** the Questions.

(20 Marks)

1. The question consists of **Eight** multiple choice questions. **Each** MCQ carries **Two** marks. Choose **only one** appropriate choice. (8Qx2M=16 Marks)

- (i) Design rate of superelevation for horizontal highway curve of radius 450 m for a mixed traffic condition in plain terrain, having a radius of 125 kmph is
a. 1.0 b. 0.05 c. 0.07 d. 0.154
- (ii) A curve has a descending gradient of 1 in 40 followed by an ascending gradient of 1 in 50. The length of curve required for a design speed of 80 kmph for comfort condition is
a. 199 m b. 116 m c. 58 m d. 37 m
- (iii) The extra widening (in m) required for a two-lane NH at a horizontal curve of 300 m radius, considering a wheel base of 8 m and a design speed of 100 kmph is
a. 0.21 b. 0.62 c. 0.72 d. 0.82
- (iv) While designing a road with a ruling gradient of 6 %, if a horizontal curve of 50 m radius is encountered, the compensated gradient at the curve should be
a. 4.5 % b. 4.75 % c. 5.0 % d. 5.25%
- (v) The average spacing between the vehicles in a traffic stream is 20 m, then the density (veh/km) of the traffic stream is
a. 50 b. 40 c. 30 d. 20
- (vi) In highway geometric design, cumulative speed distribution is drawn and the design is checked at which percentile speed?
a. 15th b. 50th c. 85th d. 98th
- (vii) The free speed of a car is 100 kmph while that of a bus is 50 kmph. The length of car and bus is 4 m and 8 m respectively. The PCU of the bus is
a. 2 b. 4 c. 6 d. 8
- (viii) The ruling minimum radius (in m) of a horizontal curve of an NH in plain terrain for a ruling design speed of 100 kmph with $e = 0.07$ and $f = 0.15$ is close to
a. 250 b. 36 c. 360 d. 300

2. Match the information related to the test on aggregates are given- (4 marks)

Group- I

- P. Resistance to impact
 Q. Resistance to wear
 R. Resistance to weathering action
 S. Resistance to crushing

Group- II

- a. Hardness
 b. Strength
 c. Water absorption
 d. Soundness
 e. Toughness

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (4Qx10M=40M)

3. A test vehicle was traveling at a constant speed of 55 kmph over a stretch of 3 km for collecting the speed delay study data. The following data was noted down by observer-

Direction of Trip	Delay time in minutes	Number of vehicles		
		Overtaken	Overtaking	Opposite
N→S	1.6	11	9	185
S→N	1	2	7	126

Calculate the traffic flow, journey time, journey speed and running speed on both trips.

4. What is the difference between Bitumen and Tar? Also, draw the cross section of railway track and explain the function of sleepers and ballast.
5. In the Marshall method of mix design, the CA-1, CA-2, FA, filler, and bitumen, having respective specific gravity 2.65, 2.53, 2.44, 2.41, and 1.02 are mixed in weight of 650 gm, 1400 gm, 350 gm, 125 gm, and 90 gm respectively. The volume and weight of one Marshall mould were found to be 520 cc and 1200 gm. Assuming the absorption of bitumen in aggregate is zero, calculate VMA and VFB.
6. A vehicle moving at 70 kmph on a ascending gradient highway has come to stop position to avoid collision with a stationary object. The ratio of lag to brake distance is 8:7. Calculate the value of descending gradient. By considering the descending gradient into account for SSD, calculate the traffic capacity of that highway.(reaction time of driver-3 seconds, the average length of vehicles-5 m, coefficient of friction-0.35).

Part C

Answer the Question. The Question carries **twenty** marks. (1Qx20M=20M)

7. According to Greenshields's model "The relationship between speed vs density is linear." Using this concept, determine-
- a. The expression for maximum traffic flow. (8 Marks)
- b. The maximum traffic flow, jam density at maximum traffic flow if speed $v = 80 - 0.67k$ where v is in kmph and k is in veh/km. (6 Marks)
- c. Minimum time and space headway for max. traffic flow and jam density. (3 Marks)
- d. The variation between traffic flow vs density and traffic flow vs speed. (3 Marks)