P P SAVANI UNIVERSITY

Seventh Semester of B. Tech. Examination
November 2021
SECV4041 Highway and Traffic Engineering

15.12.2021, Wednesday   Time: 9:00 a.m. To 11:30 a.m.   Maximum Marks: 60

Instructions:
1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1	Define the following :	[05]
(i)	Super elevation	
(ii)	Ruling Gradient	
(iii)	Transition curve	
(iv)	Limiting gradient	
(v)	Grade compensation	
Q - 2 (a)	Explain Road user and Vehicle characteristic.	[05]

OR

Q - 2 (a)	Write a short note on Acceleration characteristics and breaking performance.	[05]
Q - 2 (b)	Explain PIEV theory.	[05]
Q - 3 (a)	On a two way traffic road the speed of overtaking and overtaken vehicles are 65 and 40kmph respectively. If the average acceleration of overtaking vehicle is 0.92 m/s2, determine (i) Safe overtaking sight distance, indicating the detail of overtaking operation by a sketch and (ii) Minimum length of overtaking zone by a neat sketch	[05]
Q - 3 (b)	Calculate the length of transition curve on a plain terrain and the shift using the following data Design speed = 65kmph, Radius of circular curve = 220m Allowable rate of introduction of super elevation (pavement rotated about the centre line)=1 in 150 Pavement width including extra widening = 7.5m	[05]

OR

Q - 3 (a)	What will be the compensated gradient (a) If ruling gradient is 6% on a horizontal curve of radius 60m (b) If ruling gradient is 5% on a horizontal Curve of radius 60m	[05]
Q - 3 (b)	A valley curve is formed by a descending gradient of 1/25 and an ascending gradient of 1/30. Design the length of valley curve to fulfil both comfort condition and head light sight distance. (Take design speed = 80kmph and coefficient of friction = 0.35)	[05]
Q - 4	Attempt any one.	[05]
(i)	Classify the Rural and Urban Roads	
(ii)	Explain Camber and its type	

SECTION – II

Q - 1	Answer the Following: (Attempt any five)	[05]
(i)	Which material can be applied as a single coat of low viscosity liquid bituminous material to an existing road surface?	

(a)	Prime Coat	(b)	Seal Coat
(c)	Tack Coat	(d)	a and b

(ii)

In rigid pavement construction, joint filler should possess following properties

| (a) | Compressibility | (b) | Durability |
| (c) | Elasticity | (d) | All of the above |

(iii) Which one of the following is not a desirable property of the sub grade soil as a highway material?

| (a) | Stability | (b) | Ease of Compaction |
| (c) | Good Drainage | (d) | Bitumen Adhesion |

(iv) Pneumatic Roller can be used for compacting of the which type of soils?

| (a) | Non Plastic Silts | (b) | Fine Sands |
| (c) | Non Plastic Silts and Fine Sands | (d) | None of the above |

(v) Which bar shall be aligned to the finished surface of the slab and to the center line of the carriageway?

| (a) | Tie Bars | (b) | Dowel Bars |
| (c) | both | (d) | None of the above |

(vi) Bitumen grade 30/40 indicates that under the standard test conditions, the penetration value should be

| (a) | 0.3 mm to 0.4 mm | (b) | 0.03 mm to 0.04 mm |
| (c) | 0.3 cm to 0.4 cm | (d) | 0.03 cm to 0.04 cm |

(vii) Which one of the material is used for surface dressing in cold weather as well as in wet conditions and maintenance works?

| (a) | Tar | (b) | Medium Curing Cutback |
| (c) | Emulsion | (d) | Slow Curing Cutback |

Q - 2 (a) What is the Highway capacity and Level of Service and discuss the factors affecting the same. [05]

Q - 2 (b) Explain the Process for Bituminous Road construction [05]

OR

Q - 2 (a) What are the Mechanical property of the Road Materials and explain the different tests to perform the quality checks of the materials. [05]

Q - 2 (b) Explain the Process for Water bound Macadam Road construction [05]

Q - 3 (a) The load penetration values of CBR tests conducted on two specimen of a soil sample are given below. Determine the CBR value of the soil if 100 division of the load dial represents 190 kg load in the calibration chart of the proving ring. [05]

Penetration of Plunger(mm)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0
Load dial readings, divisions	0	8	15	23	29	34	37	43	48	57	63
Load dial readings, divisions	0	0.5	1.5	2.5	6.0	13	20	30	38	50	58

Q - 3 (b) Design two phase signal by Webster method based on following data: q_A = 400 PCU/hr. q_B = 250 PCU/hr. S_A = 1250 PCU/hr. S_B = 1000 PCU/hr. All red time required for pedestrian crossing is 12 sec. [05]

OR

Q - 3 (a) What are the different tests to be perform to check the quality of Bituminous materials along with the permissible limits. [05]

Q - 3 (b) What are the Different General Design Consideration to be adopted while design of Rigid and Flexible pavement [05]

Q - 4 Attempt any one.

(i) Explain Burmister's theory. [05]

(ii) What is the significance of CBR test conducted in laboratory? How this value is related to the percentage clay contents?

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