

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024

Subject Code:3154008

Date:17-12-2024

Subject Name:Highway and Traffic Engineering

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) What are different vehicular characteristics which affect the road design?	03
	(b) Briefly discuss the merits and demerits of road transportation.	04
	(c) Calculate the setback distance on a levelled road curve of 235 m radius for the design speed of 85 kmph. Take $f = 0.36$. Show the setback distance in the sketch.	07
Q.2	(a) Define: SSD, Camber, Sumeet curve.	03
	(b) Draw a sketch of NH in embankment. Show its all components and boundaries stating the significance.	04
	(c) What would be SSD on a levelled single lane two-way road for 75 kmph speed and $f = 0.36$? If this road has 1 in 20 gradient, then workout SSD for up and down gradient.	07
	OR	
	(c) Determine OSD on 2 lane one-way and 2 lane two-way highway for the design speed of 75 kmph. Assume, acceleration of overtaking vehicle = 1.65 kmph/sec.	07
Q.3	(a) What are the desirable properties of sub-grade soil?	03
	(b) Explain with sketch Flakiness Index test of road aggregates.	04
	(c) Design the rate of super elevation for a horizontal highway curve of radius 260 m and speed 80 kmph. If the maximum super elevation of 0.07 is not to be exceeded, calculate maximum allowable speed on this curve.	07
	OR	
Q.3	(a) Distinguish between Cutback and Emulsion.	03
	(b) Explain with sketch Ductility test of the bitumen.	04
	(c) An ascending gradient of 1 in 40 meets a descending gradient of 1 in 50. Determine the length of summit curve to provide ISD, for a design speed of 85 kmph. Take $f = 0.36$. Assume all other data.	07
Q.4	(a) Distinguish between Flexible and Rigid pavement.	03
	(b) Explain with sketch CBR testing procedure.	04
	(c) The loaded weight on the rear dual wheels of a truck is 5200 kg. The c/c spacing and clear space in the dual wheels are 30 cm and 10 cm respectively. Calculate the ESWL for pavement thickness of (i) 25 cm, and (ii) 40 cm.	07

OR

- Q.4** (a) Define: Top-down crack, EWLF, Tie bar. **03**
 (b) Explain with sketch Marshall Stability testing procedure. **04**
 (c) Calculate the stress at corner region of cement concrete pavement using Westergaard's stress equation modified by Kelly. **07**
 Take wheel load = 5500 kg, $E_c = 3 \times 10^5 \text{ kg/cm}^2$, Pavement thickness = 19 cm, $\mu = 0.15$, Modulus of subgrade reaction $k = 5 \text{ kg/cm}^3$, Radius of contact area = 15 cm.

- Q.5** (a) Define: PCU, SMS, LOS. **03**
 (b) Discuss briefly different road users' characteristics affecting traffic performance. **04**
 (c) The speed-density relationship of traffic on a section of a freeway lane was estimated to be $V_x = 17.8 \ln [225/k]$ as per Greenberg's model. (a) Find flow, speed and density at Maximum flow, (b) Find jam density. **07**

OR

- Q.5** (a) Define: Traffic density, Time headway, Design capacity of highway. **03**
 (b) Explain with sketch procedure of Spot-speed survey of vehicles on highway. **04**
 (c) From the following data of spot-speed study, draw graphs for frequency (%) –vs- Speed range and Cumulative frequency (%) –vs- Speed. Also, calculate: TMS, SMS, speed to be used in geometric design, speed for traffic regulation. **07**

Speed range (kmph)	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
No. of vehicles	5	9	15	22	28	21	14	6	3
