Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2144003 Date:20/05/2019

Subject Name: Basics of Transportation Engineering

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use Arithmetic Graph paper is allowed.**

			MARKS
Q.1	**(a)**	Explain in brief characteristics of different modes of transport and their integrations and interactions.	**03**
	(b)	Explain factors affecting the performance, design and operation of a road transportation system.	**04**
	(c)	Explain various cross sectional elements of road pavement in details along with neat sketch.	**07**
Q.2	**(a)**	What is sight distance? Explain in short various types of sight distance consider for design of road pavement.	**03**
	(b)	Enlist factors affecting computation of sight distance? Explain PIEV theory in details with neat sketch.	**04**
	(c)	Design the cant required to maintain the speed on a horizontal curve with a radius of 250 m on national highway. Safe limit of lateral friction is 0.15.	**07**
		OR	
	(c)	Calculate the length of transition curve required, for a carriageway of 7.5 m width on straight portions, if the design speed is 65 km/hr and the road is passing through rolling terrain. The radius of the horizontal curve is 200 m.	**07**
Q.3	**(a)**	What is Gradient? Explain various types of gradient in brief.	**03**
	(b)	Explain camber and show the various shapes of camber with the help of neat sketch.	**04**
	(c)	A falling gradient 1 in 20 meets rising gradient 1 in 40 on a National Highway in plain terrain. Find the length of the valley curve, which should provide safe driving at night.	**07**
		OR	
Q.3	**(a)**	Explain in detail 'Grade compensation'.	**03**
	(b)	Explain various types of failures in cement concrete pavements and their causes.	**04**
	(c)	Explain various desirable properties of aggregates. Explain Los Angeles abrasion test for aggregates as per IS: 2386 (Part 5).	**07**
Q.4	**(a)**	State the factors affecting traffic stream flow characteristics.	**03**
	(b)	What are essential requirement of pavement? Draw typical cross section of a flexible pavement.	**04**

(c) Design a new flexible pavement for a two lane undivided carriageway using the following data: **07**

(a) Design CBR value of subgrade = 4 %
(b) Initial traffic on completion of construction = 300 cv per day
(c) Average growth rate = 5 % per year
(d) Design life = 10 years
(e) VDF value = 2.5

Use figure 1, table no. 1 for calculating composition of pavement component (as per IRC guidelines).

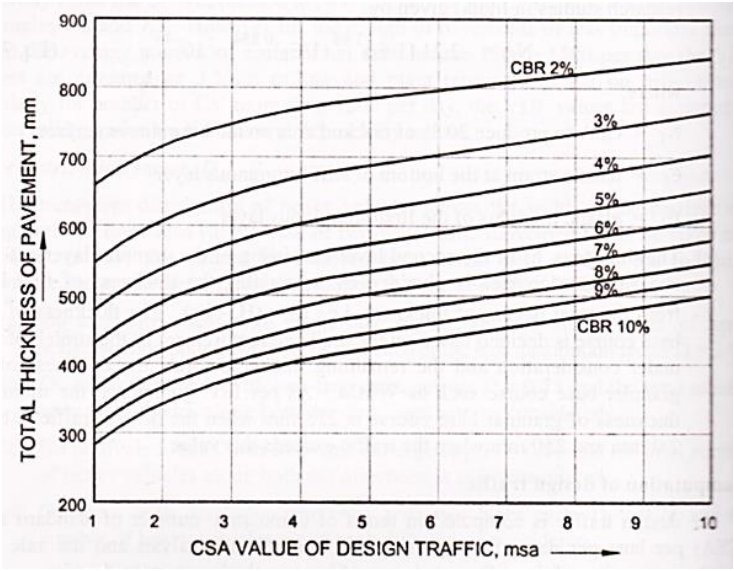

Fig.1. CBR design chart for determination of total pavement thickness for traffic with CSA of 1.0 to 10 msa

Table 1. Pavement design with recommended component layers for cumulative traffic range 1 to 10 msa

CBR, %	CSA, msa	Total pavement thickness, mm	Granular sub-base course, mm	Granular base course, mm	Binder course, mm	Surface course, mm
3	1	550	435	225		20 PC
	2	610	335	225	50 BM	20 PC
	3	645	335	250	60 BM	20 PC
	5	690	335	250	60 DBM	25 SDBC
	10	760	335	250	90DBM	40 BC
4	1	480	255	225		20 PC
	2	540	265	225	50 BM	20 PC
	3	580	280	250	50 BM	20 PC
	5	620	285	250	60 BM	25 SDBC
	10	700	330	250	80 BM	40 BC
6	1	390	165	225		20 PC
	2	450	175	225	50 BM	20 PC
	3	490	190	250	50 BM	20 PC
	5	535	210	250	50 BM	25 SDBC
	10	615	260	250	65 BM	40 BC
8	1	375	150	225		20 PC
	2	425	150	225	50 BM	20 PC
	3	450	150	250	50 BM	20 PC
	5	475	150	250	50 DBM	25 SDBC
	10	550	200	250	60 DBM	40 BC
10	1	375	150	225		20 PC
	2	425	150	225	50 BM	20 PC
	3	450	150	250	50 BM	20 PC
	5	475	150	250	50 DBM	25 SDBC
	10	540	200	250	50 DBM	40 BC

OR

Q.4 **(a)** Write short note on 'Greenberg's logarithmic model' **03**

(b) What are the various types of road markings and their uses? **04**

(c) State the concept of PCU value and the factors affecting PCU values **07**

Q.5 **(a)** What is the objective of carrying out Spot Speed Studies? List out the expected outcomes through this study? **03**

(b) What is utility of GIS? Explain essential components of GIS in brief. **04**

(c) Determining Speed Characteristics from as of Speed Data given for two wheeler based on the spot speed studies carried out at particular survey station. Following table shows two wheeler speed data collected on a Sub-arterial highway during a speed study. **07**

Two Wheeler No.	Speed (km/hr)	Two Wheeler No.	Speed (km/hr)
1	26	11	38
2	24	12	45
3	29	13	45
4	30	14	41
5	33	15	54
6	52	16	67
7	41	17	54
8	50	18	44
9	52	19	54
10	61	20	45

Develop the frequency histogram and the frequency distribution of the data and determine:
(a). Average Speed
(b). Design Speed
(c). Safe Speed,
(d). Modal Speed and
(e). Pace Speed.
Use Arithmetic Graph paper for plotting the PDF and CDF.

OR

Q.5 **(a)** Explain basic difference between image processing system and geographic information system (GIS). **03**

(b) Explain the philosophy of Macroscopic stream model development? How different is it from Microscopic approach? **04**

(c) What is Intelligent Transport Systems (ITS)? What are the components of ITS? Explain how Integration of ITS and GIS can be used for overall monitoring of transportation systems. **07**

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