Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 711308N **Date: 24-06-2014**

Subject Name: Highway Geometric Design

Time: 02:30 pm - 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full mark.**

Q.1	**(a)**	Discuss the necessity of Geometric Design of highway. What are the basic considerations to be kept in mind while designing the highway?	**07**
	(b)	Give the classification of Urban roads. Discuss about their accessibility and connectivity.	**07**
Q.2	**(a)**	Define intersection. Explain various principles of intersection design for safety of traffic.	**07**
	(b)	What are the reasons for providing greater carriageway width on curves? Derive an expression for the same.	**07**
		OR	
	(b)	Derive an expression for finding super-elevation required if the design co-efficient of lateral friction is ófô.	**07**
Q.3	**(a)**	What do you mean by camber? Explain the reasons for providing camber of the road surface. What are the camber values for different road surface types in India? What are the disadvantages of Heavy camber?	**07**
	(b)	Draw a typical cross-sections of the following roads indicating the widths of pavement, roadway and land: i) National highway in embankment in rural area ii) National highway in cutting iii) A divided highway in urban area	**07**
		OR	
Q.3	**(a)**	Briefly explain the role of pavement surface characteristics in highway geometric design. State the factors affecting friction between pavement surface and tyres of vehicles.	**07**
	(b)	Discuss the human factors governing road user behavior while dealing with highway engineering design.	**07**
Q.4	**(a)**	Calculate the safe stopping sight distance for design speed of 50kmph for following two cases: Case (i) two-way traffic in a two lane road and Case (ii) two-way traffic in a single lane road.	**07**
	(b)	Why are overtaking zones provided? What is the basis of deciding its length? Draw a neat sketch and the show the signs to be installed and their positions.	
		OR	
Q.4	**(a)**	A six-lane divided carriageway has a curve 1000m long and a radius of 500m. The safe stopping sight distance is 200m. Calculate the minimum set-back distance from the inner edge of the road to the edge of a building to ensure safe visibility. The pavement width per lane is 3.5m.	**07**

	(b)	Explain the factors affecting Stopping sight distance.	**03**
		Calculate safe stopping sight distance for design speed of 90kmph and an ascending gradient of 5%.	**04**
Q.5	**(a)**	What are the objectives of channelization? Discuss the various features of channelization. Explain with the help of neat sketches.	**07**
	(b)	A two-lane 7 m wide pavement on a National Highway in hilly terrain (snow bound) has a curve of radius 60m. The design speed is 40kmph. Determine the length of transition curve. Also determine the total length of the curve and tangent length if the deflection angle is 60°. Make suitable assumptions.	**07**

OR

Q.5	**(a)**	A valley curve is formed by a descending grade of 1 in 25 meeting ascending grade of 1 in 30. Design the length of valley curve to fulfill both comfort condition and head light sight distance requirements for a design speed of 80kmph. Assume allowable rate of change of centrifugal acceleration as $C = 0.6$ m/sec^3.	**07**
	(b)	What are the general controls to be kept in mind in designing vertical profile of a road?	**07**

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