

**GUJARAT TECHNOLOGICAL UNIVERSITY****M. E. - SEMESTER – I • EXAMINATION – WINTER 2012****Subject code: 711308N****Date: 16-01-2013****Subject Name: Highway Geometric Design - Elective 1****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 marks.

**Q.1 (a)** Define Design speed in Geometric Design. What percentile speed is usually taken as Design speed? What are the suggested Design speeds in India for Rural and Urban conditions? What is the distinction between ruling and minimum design speeds and where are they adopted? **07**

**(b)** What considerations are to be kept in mind while drawing up Geometric Design standards for a country? **07**

**Q.2 (a)** Explain camber. What are the objects of camber? Discuss the factors on which the amount of camber to be provided depends. Specify the recommended ranges of camber for different types of pavement surfaces. **07**

**(b)** What is Super-elevation? Explain the factors affecting it. **07**  
Design the super-elevation for a State Highway in mountainous terrain with the radius of 120 m. Comment on the results.

**OR**

**(b)** Calculate the safe driving speed on a curve of radius 200m and having a superelevation of 0.07. Assume suitable value of friction. Is the curve meeting the NH standard in rolling terrain? If the pavement is 7m wide, how much should the outer edge be raised if super-elevation is provided by rotating about the inner edge? **07**

**Q.3 (a)** Explain ruling, limiting and exceptional gradients. Specify the values recommended by IRC for plains and hilly areas. **07**

**(b)** A two-lane 7 m wide pavement on a National Highway has a curve of radius 400m. Determine the length of transition curve making suitable assumptions. **07**

**OR**

**Q.3 (a)** Calculate the length of transition curve and the shift. The design speed and radius of circular curve is 65 kmph and 220 m respectively. Pavement width including extra widening is 7.5 m. Allowable rate of introduction of superelevation is 1:150 (Note: pavement rotated about centre line) **07**

**(b)** What are the general controls to be kept in mind in designing vertical profile of a road? **07**

**Q.4 (a)** The speed of the overtaking vehicle is 100kmph. If the acceleration of the overtaking vehicle is 2.5 kmph per second, calculate safe OSD for (i) One-way traffic and (ii) Two-way traffic road. Also draw the sketch of overtaking zone for the latter case. **07**

**Q.4 (b)** Explain the role of pavement surface characteristics in highway geometric design. State the factors affecting friction between pavement and tyres of vehicles. **07**

**OR**

**Q.4 (a)** Explain the merits of transition curve in the highway. Enlist the methods of setting out transition curve in the field. **07**

**Q.4 (b)** How do the vehicular characteristics affect the Geometric Design standards? Explain briefly. **07**

**Q.5 (a)** What are the basic principles of intersection design to provide safety of traffic? **07**

**(b)** Describe with sketches the various types of grade separated intersections and the conditions under which they are adopted? **07**

**OR**

**Q.5 (a)** Derive a formula determining the length of a sag curve for fulfilling rider comfort criterion. **07**

**(b)** What are the objectives of channelization? Discuss the various features of channelization. Explain with the help of neat sketches. **07**

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