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10CV755

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018

### Highway Geometric Design

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least TWO questions from each part.**

#### PART – A

- 1 a. Briefly discuss the various design factors to be considered for geometric design of highways. (10 Marks)  
b. Enumerate the concept of PCU in geometric design of Highways. List out the factors governing PCU. Give some typical values as recommended by IRC. (10 Marks)
- 2 a. What is camber? List the functions of camber. Discuss the factors governing the camber. Discuss shapes of camber with the help of neat sketch. (10 Marks)  
b. Write a note on following and mention the IRC standards :  
i) Carriage way ii) Right of way. (10 Marks)
- 3 a. With sketches indicate the circumstances in which sight distance is affected, describe how the sight distance required at an uncontrolled intersection is estimated. (10 Marks)  
b. The speed of overtaking and overtakes vehicles are 70kmph and 40kmph, respectively on a two way traffic road. If the acceleration of overtaking vehicles is  $0.99 \text{ m/sec}^2$ .  
i) Calculate safe overtaking sight distance.  
ii) Mention the minimum length of overtaking zone  
iii) Draw a neat sketch of overtaking zone and show the position of the sign posts. (10 Marks)
- 4 a. Write note on mechanical widening and psychological widening. (06 Marks)  
b. What is transition curve? Explain types of transition curve. (06 Marks)  
c. Calculate the length of transition curve and the shift using the following data. Design speed of 65 kmph, radius of circular curve = 220m. Allowable rate of introduction of super elevation 1 in 150, pavement is rotated about the centre line and pavement width including extra widening is = 7.5m. (08 Marks)

#### PART – B

- 5 a. What are the circumstances in which a valley curve is formed? Indicate with sketches. (06 Marks)  
b. Derive the expression for calculating length of valley curve of parabolic shape for comfort condition. (06 Marks)  
c. A vertical summit curve is formed at the intersection of two gradients, +3.0 and -5.0 percent. Design the length of summit curve to provide stopping sight distance for a design speed of 80kmph. Assume data as per IRC. (08 Marks)
- 6 a. Explain the need of grade separated intersection and give advantages and disadvantages of grade separated intersection. (10 Marks)  
b. With a neat sketch, explain channelized intersection also discuss advantages of channelized intersection. (10 Marks)

- 7 a. Draw a neat diagram of rotary intersection (roundabout) and show the different elements? (10 Marks)
- b. Draw a neat sketch of
- i) Diamond interchange
  - ii) Half clover leaf and explain any two advantages of each. (10 Marks)
- 8 a. With sketches explain the methods of sub surface drainage with respect to
- i) Lowering of water table
  - ii) Control of seepage flow. (10 Marks)
- b. A longitudinal channel with a trapezoidal cross section is to be constructed in a cut section. The longitudinal slope is 1 in 2500, soil is clay with Manning's coefficient as 0.024. take discharge of  $3\text{m}^3/\text{sec}$  and velocity of flow as  $0.6\text{m/s}$ . (10 Marks)

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