VTU QUESTION BANK

UNIT 1

1. Briefly discuss the various design factors to be considered for geometric design of highway**.(dec2013/jan2014,may/Jun 2010)**
2. Explain the design control and criteria which governs the design and highway**.(dec2011, dec2010,jun/jul 2011)**
3. Enumerate the concept of PCU in geometric design of highways. List out the factors governing PCU. Give some typical values as recommended by IRC**.(dec2013/jan2014, june/july2013, dec2011, may/Jun 2010, dec2010, Jun/jul 2011)**
4. Explain the geometric elements to be considered for the design of highway**(June/july2013)**
5. Explain the objects of highway geometric design. List the various geometric elements to be considered in the highway design.**(dec2010)**
6. Explain significance of design speed and design vehicle in the geometries**(June/july2013)**
7. Explain the important functional aspects of geometric design.**(Jun/jul2011)**

UNIT 2

1. List the important pavement surface characteristics and explain briefly: i) Friction and factors affecting friction; ii) Pavement unevenness. **(Dec 2011, Dec 2010, June/July 2011, Dec 2012)**
2. Write notes on the following and mention the IRC standards: i) Carriage way ii) Right of way. **(Dec 2011)**
3. Draw the typical cross sections of the following roads indicating all the details: i) NH - in cutting ii) SH - in embankment. **(Dec 2010, 2012)**
4. What is camber? What are the objectives of providing camber? When straight and parabolic cambers are preferred? List the functions of camber. Discuss the factors

governing camber. Explain different shapes of camber with help of neat sketches **(June/july 2011, dec2013/jan2013)**

5. What is right of way? State the factors influencing right of way **(June/july 2011, Dec 2012)**
6. What Objectives of providing transition curves **(Dec 2010)**
7. Mention the various cross-sectional elements to be designed for a pavement and explain them briefly. **(June 2010, May/ June 2010)**
8. Design the road hump as per IRC recommendations, with a neat sketch**.(June 2010, May/ june 2010)**
9. Distinguish between skid and slip with practical examples. Enumerate the factors affecting friction of skid resistance**. (dec2013/jan2014)**

UNIT 3

1. Draw a neat sketch of overtaking zone with all detail for overtaking and overtaken vehicles speeds are 80 kmph and 65 kmph. Take average rate of acceleration as 3.6 kmph/sec, single lane**. (Dec 2011, June/july 2011, June 2010, May/ june 2010)**
2. Calculate the SSD on a highway at a descending gradient of 2% for a design speed of 80kmph. **(Dec 2010, Dec 2012)**
3. Explain sight distance and factors causing restriction to sight distance. Give significance of SSD, ISD and OSD. **(Dec 2011)**
4. Derive an expression for calculating the overtaking sight distance on the highway **(June 2010, Dec2011, May/ june 2010)**
5. What are the factors on which the SSD depends? Explain the reaction time of the driver. **(Dec 2010)**
6. Find the safe overtaking sight distance for a design speed of 96 kmph. Assume all the required data as per IRC **(Dec 2010, Dec 2012)**
7. Derive the expression for SSD for ascending, descending gradient and level surface **(June/july 2011)**
8. What is stopping sight distance? List out the factors affecting SSD. Derive the expression for finding SSD on a road with a down gradient of — n%**.(dec2013/jan2014)**

9. The speeds of overtaking & overtaken vehicles are 96 kmph and 80 kmph respectively, on a two way traffic road. If the acceleration of overtaking vehicle is 2.5 kmph/sec calculate the safe overtaking sight distance (OSD) sketch the overtaking zone **(dec2013/jan2014)**

UNIT 4

1. Derive necessary conditions for centrifugal ratio to avoid overturning and skidding of vehicle **(Dec 2011, June/july 2011, Dec 2012, Dec 2010)**

2. Write a note on maximum and minimum super elevations **(Dec 2011)**
3. Derive expression for super elevation **(May/ june 2010)**
4. What are the objectives of providing extra widening of pavements on horizontal curves? Derive an expression for the same. **(Dec 2010)**
5. Design all the geometric features of a horizontal curve for a state highway passing through rolling terrain, assuming all the data as per IRC for a ruling minimum radius. Also, specify the minimum setback distance for a sight distance of 255 mts. **(Dec 2010)**

6. While aligning a highway in a built up area, it was necessary to provide a horizontal curve of radius 325 meter. Design the following geometric features. I) Super elevation ii) Extra widening of pavement iii) length of transition curve Data available are design speed = 65 kmph, length of wheel base of largest truck = 6 pavement width = 10.5m**. (June/july 2011)**

7. There is a horizontal highway curve of radius 400m and length 200m on this highway. Compute the setback distance required from the centre line on inner side of curve so as to provide for safe overtaking distance of 300m. The distance between the centerline of road and inner lane is 1.9 m**. (June/july 2011, Dec 2012)**

8. A national highway passing through rolling terrain in heavy rainfall area has a horizontal curve of radius 500 m. Design the length of transition curve. Assume data suitably. **(June 2010, Dec 2012, May/ June 2010)**

9. What is superelevation? With the aid of sketches, explain how super-elevation is introduced on a horizontal curve in the field**(Dec 2013/jan2014)**
10. Calculate the length of transition curve of the shift using the following data :

Design speed=80 kmph; Radius of horizontal curve =500m; normal pavement width=7 m. Allowable rate of introduction of super-elevation =1 in 150 (Pavement rotated about inner edge). **(Dec 2013/jan2014)**

UNIT 5

1. Explain the following with IRC specification: i) Ruling gradient ii) Limiting gradient ii) Exceptional gradient IV) Minimum gradient. **(Dec 2011, June/july 2011, Dec 2012, Dec 2013/Jan 2014)**
2. Define a gradient; explain in detail the different gradients adopted on a highway with specifications as per IRC **(Dec 2010)**
3. A valley curve is formed by descending grade of 1 in 25 meeting an 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 80 kmph. Assume c = 0.6 m/sec. **(Dec 2013/Jan 2014)**
4. Explain how the length of valley curve is designed. **(Dec 2010)**
5. 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 a SSD for a design speed of 80 kmph. Assume any other data as per IRC. **(Dec 2010, Dec 2012, June/july 2011)**
6. Explain the different cases of finding the length of summit curve for varying SSD and OSD **(May/ June 2010)**
7. An ascending gradient of 1 in 100 and a descending gradient of 1 in 120 meet at a point. Design a summit curve for a speed of 80 kmph so as to have an OSD of 420 m. 25 meeting an ascending grade. **(June/july 2011, June 2010, May/ June 2010)**

UNIT 6

1. Explain need of grade separated intersection and give advantages and disadvantages of grade separated and at grade intersection. **(Dec 2011, Dec 2010,Dec2013/Jan 2014)**
2. What are the advantages and limitation of unchannalized and channelized intersection? **(Dec 2011, June/july 2011, Dec 2012)**
3. What are the grade-separated intersections? Explain the situations at which grade separated intersections are justified. **(Dec 2010, Dec 2012)**

4. Explain the principles governing the design of intersections.**(June/july 2011, Dec 2012)**
5. With neat sketches, explain the different types of grade intersections. Explain the advantages and limitations of Rotary intersection **(June 2010)**
6. Explain the important steps followed while designing rotary intersection along with relevant formulae employed. **(June 2010,May/ june 2010)**
7. What is a rotary intersection? Under what circumstances traffic rotary is justified? Mention advantages and limitation of a rotary intersection. **(Dec 2013/Jan2014)**

UNIT 7

1. Explain the cloverleaf interchange with its merits and demerits. **(Dec 2011)**
2. List the advantages and disadvantages of a rotary intersection **(Dec 2010, June/july 2011, May/ june 2010)**
3. Design the rotary x^n for the data given below, with suitable assumptions. The highways intersect at right angles and have a carriage way width of 15 mts. Also draw the diagram of the rotary designed. **(Dec 2010)**

Approach	Left turning			Straight ahead			Right turning		
	1	2	3	1	2	3	1	2	3
N	200	50	100	250	100	150	150	50	80
E	180	60	80	220	50	120	200	40	120
W	220	50	120	180	60	100	250	60	100
S	250	80	100	150	50	90	160	70	90

1-car passengers

2-heavy commercial vehicles

3-scooters/motor cycles

4. With neat sketches, explain the advantages of i) Half clover leaf, ii) Clover leaf intersection. **(Jun/jul2011).**
5. With the help of neat sketches, indicate various intersections at grade. State the advantages of grade separated intersections.**(Dec 2013/Jan 2014)**
6. What is an overpass and underpass? Mention the advantages and disadvantages of overpass and underpass. **(Dec 2013/Jan 2014)**

UNIT 8

1. Explain the significance of highway drainage. **(Dec 2011, Dec 2012)**
2. Explain with neat sketches, how the subsurface drainage is provided to lower the water table and control seepage flow **(Dec 2011 June/july 2011, May/ june 2010)**
3. Explain the design procedure of filter material used in subsurface drain. **(Dec 2011)**
4. What are the requirements of a good highway drainage system?**(June/july 2011)**
5. The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is 0.9 m^3/sec. Design the cross section and longitudinal slope of a trapezoidal drain assuming the bottom width of section to be 1.0 m and cross slope to be IV to 1.5 H. The allowable velocity of flow in the drain is 1.2 m/sec and Manning's roughness co-efficient is 0.02 **(June/july 2011, May/ june 2010,Dec 2013/Jan2014)**
6. State the requirements of an efficient drainage system. With the help of neat sketches, explain how surface drainage is effected in rural highways and urban roads**.(Dec 2013/Jan2014)**