Total number of printed pages: **Civil Engineering (UG)/VIII/UCE815**

2023

GEOMETRIC DESIGN OF TRANSPORTATION FACILITIES

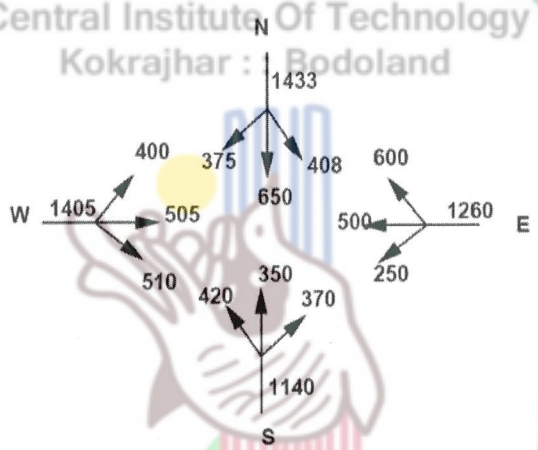
Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Calculate the length of stopping sight distance required on a one-way National Highway with design speed of 80 kmph. Assume coefficient of longitudinal friction as 0.35.	5
	b)	Calculate the SSD required on a highway at a descending gradient of 2% for a design speed of 80 kmph. Assume all other data as per IRC recommendations.	5
	c)	The driver of a vehicle travelling 60 kmph up a gradient requires 9 m less to stop after he applies brakes as compared to a driver travelling at same speed down the gradient. If the coefficient of longitudinal friction is 0.4, what is the value of gradient?	10
2.	a)	Calculate the length of stopping sight distance required on a two-way single lane road with design speed of 100 kmph. Assume coefficient of longitudinal friction as 0.35.	5
	b)	Calculate the value of intermediate sight distance for a highway with a design speed of 65 kmph. Assume suitably all other data required.	5
	c)	On a two-way traffic road, the speed of overtaking and overtaken vehicles are 65 and 40 kmph respectively. If the average acceleration is 0.92 m/s^2. Determine the overtaking sight distance required indicating the details of overtaking operation. Also sketch the overtaking zones.	10
3.	a)	Calculate the values of ruling minimum radius and absolute minimum radius of horizontal curve on national highway in plain terrain. Assume ruling design speed and minimum design speed values as 100 and 80 kmph respectively.	5
	b)	Calculate the extra widening required for a pavement of width 7 m on a horizontal curve of radius 200 m if the longest wheel base of vehicle expected on the road is 6.5 m. Design speed is 65 kmph.	5

	c)	A national highway passing through a flat terrain has a horizontal curve of radius equal to the ruling minimum radius. If the design speed is 100 kmph, calculate Ruling minimum radius, SSD, Superelevation, Extra widening and Length of transition curve.	10
4.	a)	There is a horizontal curve of radius 400 m and length 200 m on the highway. Compute the set back distance required from the centre line on the inner side of the curve so as to provide SSD of 90 m. The distance between the centre line of the road and the inner lane is 1.9 m.	5
	b)	Draw full clover leaf interchange showing the direction of traffic.	5
	c)	Traffic at a rotary intersection is shown below. If the entry and exit width of a rotary is 10 m, determine the capacity of rotary. 	10
5.	a)	An ascending gradient of 1 in 60 meets a descending gradient of 1 in 50. Find the length of vertical summit curve for a SSD of 180 m.	5
	b)	An ascending gradient of 1 in 100 meets a descending gradient of 1 in 120. A summit curve is to be designed for a speed of 80 kmph so as to have an overtaking sight distance of 470 m. Design the length of summit curve.	5
	c)	Draw the neat sketch of a rotary interchange showing the various components. What are the advantages and disadvantages of rotary. Under what circumstances rotary interchange is suitable?	10
6.	A State highway passing through a rolling terrain has a horizontal curve of radius equal to the ruling minimum radius. Design the following geometric features of this horizontal curve		5x4=20
	a)	Ruling minimum radius	
	b)	Superelevation	
	c)	Extra widening of pavement	
	d)	Length of transition curve	