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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VII**

Branch: Civil Engineering **Duration: 3 hrs.**

Course Code: 22CV7PEGDR **Max Marks: 100**

Course: Geometric Design of Roads

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Explain the factors that control the geometric elements of a highway.	CO1	PO 1	**8**
	b)	Define PCU. Explain the factors affecting it.	CO1	PO1	**8**
	c)	Define skid and skip. List the factors affecting the skid resistance in a highway pavement.	CO1	PO1	**4**
		OR			
2	a)	Define camber and the importance of providing a camber in a highway. Also, mention the recommended camber values for different types of roads as per IRC.	CO1	PO1	**8**
	b)	Explain the following with respect to highways: a) Shoulder b) Kerb c) Driveways d) Guard rails.	CO1	PO1	**8**
	c)	Draw neat sketches of the lateral placement of vehicles on a single-lane and two-lane road.	CO1	PO1	**4**
		UNIT - II			
3	a)	Calculate the minimum sight distance required to avoid the head-on collision of two cars approaching from opposite directions at 25 m/sec and 16.67 m/sec. Assume reaction time as 2.5 sec, coefficient of friction as 0.7 and brake efficiency of 50% in either case.	CO1	PO2	**8**
	b)	Briefly explain the general standards and IRC standards considered in the sight distance.	CO1	PO1	**8**
	c)	Draw neat sketches for restrictions to sight distance at horizontal and vertical curves and at intersections.	CO1	PO1	**4**

			OR			
	4	a)	Calculate the safe overtaking sight distance from the following data: The speed of overtaking and overtaken vehicles are 19.44 m/sec and 11.11 m/sec respectively, on a two-way traffic road and the acceleration of overtaking vehicle is 0.99 m/ sec^2.	*CO1*	*PO2*	**8**
		b)	Explain the design consideration for sight distance at intersections.	*CO1*	*PO1*	**8**
		c)	Explain PIEV theory.	*CO1*	*PO1*	**4**
			UNIT - III			
	5	a)	The radius of the horizontal curve is 100 m. The design speed and coefficient of lateral friction is 50 kmph and 0.15 respectively. Calculate: a) Superelevation required for full lateral friction to be assumed to develop. b) Coefficient of friction needed, if no super elevation is provided.	*CO2*	*PO2*	**8**
		b)	Calculate the total width of the pavement from the following data: Two-lane road with a horizontal curve of radius 250 m for a design speed of 70 kmph. Assume the length of the longest wheelbase of a vehicle on the road as 7.0 m.	*CO2*	*PO2*	**8**
		c)	Briefly explain the attainment of superelevation with the help of a neat sketch.	*CO2*	*PO1*	**4**
			OR			
	6	a)	Calculate the length of the transition curve from the following data: Design speed is 65 kmph, the radius of the circular curve is 220 m, pavement is rotated about center line and the allowable rate of introduction of superelevation is 1 in 150; pavement width including extra widening is 7.5 m.	*CO2*	*PO2*	**8**
		b)	Write a note on: a) Setback distance b) Curve resistance	*CO2*	*PO1*	**8**
		c)	Highlight the functions of providing a transition curve in the highway alignment.	*CO2*	*PO1*	**4**
			UNIT - IV			
	7	a)	Explain different types of gradients in the alignment of highway.	*CO2*	*PO1*	**8**
		b)	A vertical summit curve is formed at the intersection of two gradients, +3.0% and -5.0%. Design the length of the summit curve to be provided for a stopping sight for a design speed of 80 kmph. Assume t=0.5 sec and f=0.35.	*CO2*	*PO3*	**8**
		c)	Mention the IRC recommended values of gradients for roads in different terrain conditions.	*CO2*	*PO1*	**4**
			OR			

	8	a)	With the help of neat sketches, explain types of summit and valley curves.	*CO2*	*PO1*	**8**
		b)	A valley curve is formed by a descending grade of 1 in 25 meets an ascending gradient of 1 in 30. Design the total length of a valley curve if the design speed is 100 kmph so as to fulfill comfort conditions and head light sight distance for night driving after calculating the SSD required. Assume t= 2.5 sec and f=0.35.	*CO2*	*PO3*	**8**
		c)	Write a note on the resisting length of the road in a hilly area.	*CO2*	*PO1*	**4**
			UNIT - V			
	9	a)	Discuss the factors considered in the design of rotary intersections.	*CO3*	*PO1*	**8**
		b)	Draw neat sketches of channelized and un-channelized grade intersections. List the advantages of channelized intersections.	*CO3*	*PO1*	**8**
		c)	Discuss how the capacity of rotary is calculated.	*CO3*	*PO1*	**4**
			OR			
	10	a)	Discuss the different types of Grade-Separated Intersections. List the advantages and disadvantages of any two types.	*CO3*	*PO1*	**8**
		b)	Discuss the factors considered in the design and location of Toll Plaza.	*CO3*	*PO6*	**8**
		c)	List the factors to be considered while locating the Bus lay bays.	*CO3*	*PO6*	**4**

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