K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:VII
Class:FINAL	Program:B.Tech
Branch Code: CIV	Pattern:2022
Name of Course:Highway and Bridge Engineering	Course Code: CIV224001
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains two page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Define Alignment. Explain in brief the requirements of an ideal alignment.	(6)	CO1
Question No. 2			
2a)	What are the different vehicular characteristics which affect the road design? Explain in Brief.	(6)	CO4
Question No. 3			
3a)	Explain in brief grade compensation.	(5)	CO3
	OR		
3b)	Enlist and explain the types of gradient also state clearly the recommended values of them as per IRC.	(5)	CO3
3c)	Carry out the analysis of stopping sight distance by stating the meanings of important key words.	(5)	CO3
	OR		
3d)	Calculate superelevation needed to maintain the design speed of 100 kmph. If maximum superelevation of 0.07 is not to be exceeded at a horizontal curve of radius 300 m. Safe limit of transverse coefficient of friction is 0.15. Also calculate the maximum allowable speed.	(5)	CO3
3e)	Calculate safe overtaking sight distance and mention the minimum length of overtaking zone. The speed of overtaking and overtaken vehicles is 70 and 40 kmph respectively on two way traffic roads. If the acceleration of overtaking vehicle is 0.99 m/sec^3. Assume any other suitable data.	(6)	CO3
	OR		
3f)	Design the transition curve length for a speed of 100 kmph. The radius of horizontal curve is 400 m, the total pavement width at curve is 7 m and the super elevation is 0.07. Assume pavement to be rotated about the inner edge.	(6)	CO3
Question No. 4			
4a)	Classify different factors affecting the design and performance of rigid pavement.	(5)	CO5
	OR		

4b)	Elaborate the design guidelines for flexible pavements as per IRC 37-2018.	(5)	CO5
4c)	Differentiate between warping stress and frictional stress in rigid pavement.	(5)	CO5

OR

4d)	Discuss in brief the importance of highway drainage.	(5)	CO5
4e)	Calculate the VDF if pavement has to sustain cumulative standard axle load repetition of 33.40 msa during its design life. A two lane two way road is carrying an initial traffic of 1600 commercial vehicles per day is to be strengthen to cater the need of growing traffic. The rate of growth of traffic is 8% per annum. The pavement is to be designed for 20 years. It is suggested to use the factor of 0.5 to account for lateral placement of wheel loads.	(6)	CO5

OR

4f)	Calculate the wheel load stress at the edge region of a cement concrete pavement using H. M. Westergaards equation: Wheel Load = 5100 kg, Modulus of Elasticity of concrete = 3 X 105 kg/cm^2, Pavement thickness = 15 cm, Poissons ratio = 0.15, Modulus of subgrade reaction = 7 kg/cm^3 , Radius of wheel load contact = 16 cm.	(6)	CO5

Question No. 5

5a)	Discuss commonly used materials in bridge construction and compare their advantages.	(5)	CO2

OR

5b)	Differentiate between piers and abutments with suitable examples.	(5)	CO2
5c)	Compare the functions of the superstructure and substructure in a bridge.	(5)	CO2

OR

5d)	Explain the different Loads and Forces to a Bridge Withstand?	(5)	CO2
5e)	Find out maximum scour depth for a straight stream flow condition for a bridge sight if design discharge is 600 m^3 per second and mean diameter of soil bed particle is 0.6 mm. (Use constant for maximum scour depth R = 1.27).	(6)	CO2

OR

5f)	A Bridge has linear waterway of 100 m constructed across a river whose natural waterway is 120 m. Calculate a height of afflux under the bridge if discharge during flood is 1200 m^3 per second and average flood depth is 3 m.	(6)	CO2

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