SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)

QUESTION BANK

Year / Semester: III B.Tech VI Semester **Regulation: R23**

Subject and Code: HIGHWAY ENGINEERING (23CIV363T)

SYLLABUS

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the history, importance, and planning aspects of highway developmentin India.
2. Apply geometric design principles for highway alignment, sight distance, and curves.
3. Analyze traffic characteristics, capacity, level of service, and road safety measures.
4. Design flexible and rigid pavements using IRC guidelines.
5. Evaluate highway construction materials, testing methods, and maintenance techniques.

UNIT– I PLANNED HIGHWAY DEVELOPMENT IN INDIA

Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment Factors affecting Alignment- Engineering Surveys –PM Gati Shakti, NHDP (National Highways Development Project)– under current highway development initiatives-Drawings and Reports

UNIT– II GEOMETRICDESIGN of HIGHWAYS

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical Alignment-Gradients Vertical curves.

UNIT– III TRAFFICENGINEERINGSTUDIES

Basic Parameters of Traffic-Volume, Speed and Density – Definitions and their inter relation – Highway capacity and level of service concept – factors affecting capacity and level of service - Traffic Volume Studies- Data Collection and Presentation-Speed studies- Data Collection and Presentation- - Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.

UNIT– IV INTERSECTION DESIGN

Conflicts at Intersections- Channelization: Objectives –Traffic Islands and Design criteria Types of At-Grade Intersections – Types of Grade-Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersections- Intelligent Transportation Systems (ITS) –
Pedestrian and cyclist safety at intersections.

UNIT– V PAVEMENT DESIGN

Types of Pavements – Difference Between Flexible and Rigid Pavements – Pavement Components – Sub Grade, Sub Base, Base and Wearing Course – Functions of Pavement Components – Design Factors – Flexible Pavement Design Methods – G.I Method, CBR Method, (As Per IRC 37-2018) –Design of Rigid Pavements – Critical Load Positions - Westergard's Stress Equations – Computing Radius of Relative Stiffness and Equivalent Radius of Resisting Section – Stresses in Rigid Pavements – Design of Expansion and Contraction Joints in CC Pavements. Design of Dowel Bars and Tie Bars.

Prepared by K.PRUDVI

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Max Marks: 10

S.No.	CO	Questions	BT
		UNIT– I PLANNED HIGHWAY DEVELOPMENT IN INDIA	
1	1	a. What is the necessity for highway planning in India? b. What are the different road development plans in India? c. Define road network patterns used in highway planning ? d. What are the important factors affecting highway alignment? e. What is the purpose of engineering surveys in highway projects?	L4
2	1	Explain the necessity for highway planning in India and its importance for economic development?	L3
3	1	Explain the classification of roads in India according to the Indian Roads Congress?	L4
4	1	Discuss the different types of road network patterns used in highway planning with neat sketches?	L3
5	1	Explain highway alignment and discuss the various factors affecting alignment selection?	L5
6	1	Describe the different types of engineering surveys conducted in highway projects?	L4
7	1	Explain the objectives, phases, and importance of the National Highways Development Project in India?	L3
8	1	Write a detailed note on the PM Gati Shakti National Master Plan and its role in modern infrastructure development?	L5
9	1	Explain the major highway development initiatives currently implemented by the Ministry of Road Transport and Highways?	L4
10	1	Discuss the importance of drawings and reports in highway engineering projects with suitable examples?	L3
11	1	Explain the importance of road transportation in economic and social development in India ?	L3

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S.No.	CO	Questions	BT
		UNIT– II GEOMETRICDESIGN of HIGHWAYS	
1	2	a. What is geometric design of highways and why is it important? b. What are the design controls used in highway geometric design? c. Define stopping sight distance (SSD) ? d. What is super elevation in highway design? e. Define gradient and vertical curve in highway alignment ?	L4
2	2	Explain the importance of geometric design in highway engineering ?	L3
3	2	Discuss the various design controls and criteria used in highway geometric design ?	L4
4	2	Explain the elements of highway cross-section such as carriageway, shoulder, median, camber, and right of way ?	L3
5	2	Explain sight distance and its importance in highway safety ?	L5
6	2	Explain the design of horizontal alignment and factors affecting horizontal curves?	L4
7	2	Explain the concept of Stopping Sight Distance (SSD) and its components	L3
8	2	Explain Overtaking Sight Distance (OSD) and its significance in highway design ?	L5
9	2	a.) A vehicle is moving with a speed of 80 km/h ? Driver reaction time = 2.5 seconds Coefficient of friction = 0.35 Calculate the Stopping Sight Distance. b) A highway curve has a radius of 200 m. Design speed = 60 km/h Calculate the required super elevation.	L4
10	2	a.) A vehicle travels at 90 km/h and wants to overtake another vehicle moving at 60 km/h.Assume standard overtaking conditions. Calculate the Overtaking Sight Distance required. b.) The Stopping Sight Distance on a highway is 120 m. Calculate the Intermediate Sight Distance required?	L3
11	2	Explain vertical alignment in highways and the types of gradients used ?	L4

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S.No.	CO	Questions	BT
		UNIT– III TRAFFICENGINEERINGSTUDIES	
1	3	1. Define traffic volume, speed, and density. 2. What is highway capacity? 3. What is Level of Service (LOS)? 4. What are traffic volume studies? 5. What are collision diagrams used for in accident studies?	L4
2	3	Explain the basic parameters of traffic flow such as volume, speed, and density?	L3
3	3	Discuss the interrelationship between traffic flow parameters?	L4
4	3	Explain the concept of highway capacity and its importance in traffic engineering?	L3
5	3	Discuss the concept of Level of Service (LOS) and the different LOS categories (A–F)?	L5
6	3	Explain the factors affecting highway capacity and level of service?	L4
7	3	Describe traffic volume studies and their objectives?	L3
8	3	Explain the different methods used for traffic volume data collection?	L5
9	3	Explain how traffic data is presented using charts, graphs, and tables?	L4
10	3	Discuss speed studies and their objectives in traffic engineering?	L3
11	3	Discuss the causes of road accidents and their effects on traffic safety?	L3

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S.No.	CO	Questions	BT
		UNIT– IV INTERSECTION DESIGN	
1	4	a. Define intersection and conflicts at intersections. b. What is channelization in traffic engineering? c. Write the objectives of traffic islands. d. Define rotary intersection. e. What is Intelligent Transportation System (ITS)?	L4
2	4	Explain the conflicts at intersections and their types.	L3
3	4	Describe the objectives and principles of channelization.	L4
4	4	Explain traffic islands and their design criteria.	L3
5	4	Discuss the types of at-grade intersections.	L5
6	4	Explain the types of grade-separated intersections.	L4
7	4	Describe the concept and design criteria of rotary intersections.	L3
8	4	Discuss the advantages and disadvantages of rotary intersections.	L5
9	4	Explain the role of Intelligent Transportation Systems (ITS) in traffic management.	L4
10	4	Describe pedestrian safety measures at intersections.	L3
11	4	Explain cyclist safety provisions at intersections.	L3

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S.No.	CO	Questions	BT
		UNIT– V PAVEMENT DESIGN	
1	5	a. Define pavement and list its types. b. Differentiate between flexible pavement and rigid pavement. c. What are the components of pavement? d. Define subgrade and base course. e. What is the function of dowel bars?	L4
2	5	Explain the types of pavements and their characteristics.	L3
3	5	Differentiate between flexible pavements and rigid pavements.	L4
4	5	Describe the components of pavement and their functions.	L3
5	5	Explain the design factors of pavements.	L5
6	5	Discuss the flexible pavement design methods (G.I Method and CBR Method).	L4
7	5	Explain the design of rigid pavements.	L3
8	5	Discuss Westergaard's stress equations in rigid pavement design.	L5
9	5	Explain the computation of radius of relative stiffness and equivalent radius of resisting section.	L4
10	5	Describe stresses in rigid pavements under wheel loads.	L3
11	5	Explain the design of expansion joints, contraction joints, dowel bars, and tie bars in concrete pavements.	L3

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COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:		POs related to COs
CO1	**Explain** the significance, planning, and alignment of highways.	PO1, PO2, PO3
CO2	**Design** geometric elements of highways, including curves, gradients, and sight distances.	PO1, PO2, PO3
CO3	**Analyze** traffic flow, capacity, level of service, and implement road safety measures.	PO1, PO2,PO3,PO4
CO4	**Design** flexible and rigid pavements as per IRC guidelines.	PO1,PO2
CO5	**Assess** construction practices, highway materials, and pavement maintenance techniques.	PO1, PO2,PO3,PO4

TEXT BOOKS:

1. Highway Engineering – S.K. Khanna&C.E.G. Justo, Nemchand& Bros., 9th edition (2011).
2. Transportation Engineering, Volume I, C Venkatramaiah, Universities Press, 2015

REFRENCEBOOKS:

1. Principles of Highway Engineering by L.R. Kadiyali, Khanna Publishers
2. Traffic Engineering and Transportation Planning by L.R. Kadiyali andLal- Khanna Publications 9th edition
3. Highway Engineering – Dr. S.K. Sharma, S. Chand Publishers 2014 edition Code books:
4. -IRC codes IRC:37-2018 used for classification and planning (IRC SP: 30, IRC: 73).
5. IRC:37-2002 with IRC:37-2018 used for the latest flexible pavement design guideline (IRC SP: 30, IRC: 73)

Online Learning Resources:

https://nptel.ac.in/courses/105101087

CO-MAPPING

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO-1	3	2	2	1	-	-	-	-	-	1	-	2	3	2
CO-2	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO-3	3	3	3	2	2	-	2	1	-	-	-	1	3	3
CO-4	3	3	3	2	2	-	2	1	-	-	-	1	3	3
CO-5	2	2	2	1	3	-	3	1	-	1	1	2	2	2