Code No: R2021015 **R20** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, December- 2023
HIGHWAY ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) What are the key milestones and historical developments in the highway infrastructure of India? Discuss the evolution of the highway network in India since independence. [7M]

b) Discuss the advantages and disadvantages of radial road network patterns. [7M]

OR

2 a) Write the Factors affecting Alignment. [6M]

b) How do topographic surveys contribute to selecting an optimal highway alignment? [8M]

UNIT-II

3 a) The speed of overtaking and overtaken vehicles is 80 and 50 kmph respectively. On a two way traffic load, the acceleration of overtaking vehicles is 0.99 m/sec². Calculate OSD, mention the minimum length of overtaking zone and draw the sketch of the overtaking zone with all details. [7M]

b) Describe the various elements of a highway cross-section and their functions. [7M]

OR

4 a) Define vertical curves and their importance in highway design. [7M]

b) Discuss the importance of involving communities and stakeholders in the highway geometric design process. [7M]

UNIT-III

5 a) How are traffic volume, speed, and density related to each other in traffic flow analysis? [7M]

b) What is the importance of collecting and analyzing traffic volume data in transportation planning and design? [7M]

OR

6 a) Describe the objectives and methodologies involved in parking studies. [7M]

b) Explain the purpose and components of a condition diagram in accident analysis. [7M]

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UNIT-IV

7	a)	Describe the desirable properties of stone aggregates used in highway construction.	[7M]
	b)	What are the steps involved in conducting a CBR test, and what do the results indicate?	[7M]

OR

8	a)	What are the different types of bituminous materials used in highway construction?	[7M]
	b)	Discuss the importance of quality control and quality assurance in highway material selection and construction.	[7M]

UNIT-V

9	a)	What are the different types of pavements commonly used in road construction? Explain the functions and purposes of pavements in transportation infrastructure.	[7M]
	b)	Describe the California Bearing Ratio (CBR) method for flexible pavement design.	[7M]

OR

10	a)	How do rigid pavements handle various stress factors, and what are the key design criteria?	[7M]
	b)	Explain the characteristics and benefits of Roller Compacted Concrete (RCC) pavements in pavement design.	[7M]

Code No: R2021015 **R20** SET - 2

II B. Tech I Semester Regular/Supplementary Examinations, December- 2023
HIGHWAY ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1	a)	How have advancements in technology influenced highway planning and alignment in recent years?	[7M]
	b)	Explain the criteria used to classify roads in India.	[7M]

OR

2	a)	How does climate change impact highway planning and alignment decisions?	[6M]
	b)	What are the essential components of engineering drawings and reports in highway alignment design?	[8M]

UNIT-II

3	a)	Explain the design controls and criteria used in highway geometric design.	[7M]
	b)	Describe the various elements of a highway cross-section and their functions.	[7M]

OR

4	a)	Explain the economic factors that influence geometric design choices, including cost-benefit analysis.	[7M]
	b)	Explain the types of gradient.	[7M]

UNIT-III

5	a)	Differentiate between spot speed and speed and delay studies.	[7M]
	b)	Describe the objectives and methodologies involved in parking studies. What factors are considered when assessing parking demand in urban areas?	[7M]

OR

6	a)	Analyze the common causes of road accidents and their impact on traffic safety.	[7M]
	b)	Explain the purpose and components of a condition diagram in accident analysis.	[7M]

UNIT-IV

7	a)	Discuss the California Bearing Ratio (CBR) test and its application in evaluating subgrade soil strength.	[7M]
	b)	How K-values are incorporated into structural design calculations for flexible pavements?	[7M]

OR

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8 a) Describe the significance of tests like penetration, softening point, and ductility in bitumen characterization. [7M]

b) Explain the role of material selection in the maintenance and rehabilitation of existing road infrastructure. [7M]

UNIT-V

9 a) Describe the essential functions of various pavement components, including the surface, base and sub-base. [7M]

b) Discuss the Indian Road Congress (IRC) method for flexible pavement design. [7M]

OR

10 a) How do low volume roads differ in terms of pavement design requirements? [7M]

b) Discuss the features and advantages of Continuously Reinforced Cement Concrete (CRCP) pavements. [7M]

Code No: R2021015 **R20** SET - 3

II B. Tech I Semester Regular/Supplementary Examinations, December- 2023
HIGHWAY ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1	a)	Differentiate between national highways, state highways, and district roads in terms of their significance and maintenance.	[7M]
	b)	Why is highway planning essential for a country's economic and social development?	[7M]

OR

2	a)	Explain the Road Development Vision 2021 and its impact on the future of Indian road infrastructure.	[7M]
	b)	Explain the role of detailed project reports in highway project planning and execution.	[7M]

UNIT-II

3	a)	Discuss the role of geometric design in ensuring safe and efficient transportation systems.	[7M]
	b)	How do these controls help balance safety, capacity and economic considerations?	[7M]

OR

4	a)	Explain the factors effecting sight distances.	[7M]
	b)	How does geometric design impact the long-term maintenance and durability of highways?	[7M]

UNIT-III

5	a)	Explain the methods and tools used for conducting traffic volume studies.	[7M]
	b)	Define Passenger Car Units (PCU) and their role in traffic capacity analysis and How are PCU factors determined for different types of vehicles?	[7M]

OR

6	a)	Define various types of intersections, such as T-intersections, X-intersections, and roundabouts.	[7M]
	b)	Describe the principles of traffic signal design and their role in controlling traffic flow.	[7M]

UNIT-IV

7	a)	Explain the process of subgrade soil classification and the role of the AASHTO Group Index.	[7M]
	b)	Explain the importance of gradation, shape, and strength in road aggregates.	[7M]

OR

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8 a) Discuss the desirable properties of bituminous materials, such as viscosity and ductility. [7M]

b) How are specifications and standards used to maintain material quality in road projects? [7M]

UNIT-V

9 a) Discuss the critical design factors that influence the structural integrity and durability of pavements. [7M]

b) What are the advantages and limitations of the Burmister method in pavement design? [7M]

OR

10 a) Describe the specific design considerations and methods used for low volume flexible pavements according to IRC guidelines. [7M]

b) Describe the design of joints in rigid pavements, including expansion and contraction joints [7M]

Code No: R2021015 **R20** SET - 4

II B. Tech I Semester Regular/Supplementary Examinations, December, 2023
HIGHWAY ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1	a)	Describe various road network patterns used in highway planning.	[7M]
	b)	Provide an overview of the first, second and third road development plans in India and their objectives.	[7M]

OR

2	a)	What are the differences between urban and rural highway planning considerations?	[7M]
	b)	Discuss the importance of maintenance and repair in the long-term sustainability of highways.	[7M]

UNIT-II

3	a)	Why is geometric design critical in the planning and construction of highways?	[7M]
	b)	Differentiate between stopping sight distance, overtaking sight distance, and intermediate sight distance.	[7M]

OR

4	a)	Explain the principles and methods used to design horizontal curves in highways.	[7M]
	b)	How is transition curves designed to ensure smooth and safe transitions between straight and curved sections of a road?	[7M]

UNIT-III

5	a)	Define traffic volume, speed, and density in the context of traffic engineering.	[7M]
	b)	Discuss the factors that affect the capacity of highways and roadway segments.	[7M]

OR

6	a)	Discuss the preventive measures and strategies to reduce the occurrence of road accidents.	[7M]
	b)	Explain the Webster method and IRC (Indian Road Congress) method for traffic signal design.	[7M]

UNIT-IV

7	a)	What is the Modulus of Subgrade Reaction (K-value), and how is it used in pavement design?	[7M]
	b)	List the common tests conducted on road aggregates to ensure quality and durability.	[7M]

OR

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8 a) What is the Marshall Method of Mix Design, and how does it contribute to designing durable asphalt mixes? [7M]

b) How can emerging technologies improve the durability and performance of road materials? [7M]

UNIT-V

9 a) How do traffic loadings, soil conditions, and environmental factors affect pavement design? [7M]

b) Explain the design factors specific to flexible pavements, including layer thickness, materials, and load distribution. [7M]

OR

10 a) Discuss the design considerations for rigid pavements, including wheel load stresses and temperature-related stresses. [7M]

b) Explain the design principles and factors influencing the thickness and composition of concrete slabs in rigid pavements. [7M]