		OR			
11	a)	Explain the causes of Accidents. How they can be reduced?	L2	CO5 CO4	5 M
	b)	Explain the Highway Safety Problems in Urban Areas.	L2	CO5 CO4	5 M

PVP 23

Code: 23CE6501

III B.Tech - I Semester - Honors Examinations - NOVEMBER 2025

TRAFFIC ENGINEERING AND MANAGEMENT
(HONORS in CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Define Time Mean Speed and Space Mean Speed.	L1	CO1,2
1.b)	What do you understand by the term PCU? Why is it used?	L1	CO1,2
1.c)	Define Highway Capacity.	L1	CO2,1
1.d)	List out the factors affecting Level of Service.	L2	CO2,1
1.e)	Why is Parking data analysis important?	L2	CO3,4
1.f)	Name two traffic control devices.	L2	CO3,4
1.g)	List two sources of noise pollution in traffic.	L2	CO4,5
1.h)	Draw Stop and Give-Way Signs.	L3	CO4,5
1.i)	Write the purpose of lane marking.	L1	CO5,4
1.j)	What is a road safety audit?	L1	CO5,4

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2	a)	Enumerate the methods of Traffic volume data collection.	L2	CO1 CO2	5 M
	b)	Explain the speed data collection method.	L2	CO1 CO2	5 M
		OR			
3	a)	Draw the relationship among Speed, Flow and Density. How it is used in Capacity Analysis?	L3	CO1 CO2	5 M
	b)	Discuss the concept of Speed data Presentation with neat diagrams.	L2	CO1 CO2	5 M
		UNIT-II			
4	a)	Explain the concept of Level of Service (LOS). Describe the six levels of service used in highway design.	L2	CO2 CO1	5 M
	b)	Discuss the importance of highway capacity and LOS in traffic engineering and planning.	L2	CO2 CO1	5 M
		OR			
5	a)	What are traffic regulations? Explain their importance in ensuring road safety and efficiency.	L2	CO2 CO1	5 M
	b)	Explain the Traffic laws in regulation of traffic.	L2	CO2 CO1	5 M

		UNIT-III			
6	a)	Explain different types of parking facilities.	L2	CO3 CO4	5 M
	b)	Discuss about Parking Index and Parking Turnover.	L3	CO3 CO4	5 M
		OR			
7	a)	Describe the current traffic situation in urban India. What are the major challenges and trends observed?	L2	CO3 CO4	5 M
	b)	Suggest effective measures to improve traffic conditions in Indian cities.	L3	CO3 CO4	5 M
		UNIT-IV			
8	a)	What is noise pollution? What are its causes in urban traffic and how can it be reduced?	L2	CO4 CO5	5 M
	b)	What are the causes of air pollution due to traffic? Discuss various control measures to reduce its impact.	L2	CO4 CO5	5 M
		OR			
9	a)	How the road signs are classified? Explain with neat sketches.	L2	CO4 CO5	5 M
	b)	Discuss the importance of regulatory signs in traffic control and road safety.	L2	CO4 CO5	5 M
		UNIT-V			
10		Explain the various types of road markings commonly used. What are the various uses of each?	L2	CO5 CO4	10 M

PVP 23

Code: 23CE6501

III B.Tech - I Semester – Regular Examinations – NOVEMBER 2025
TRAFFIC ENGINEERING AND MANAGEMENT
(HONORS in CIVIL ENGINEERING)
Scheme of Valuation

	PART – A (2 × 10 = 20M)
1. a)	Define Time Mean Speed and Space Mean Speed. TMS – 1M SMS -1M
b)	What do you understand by the term PCU? Why is it used? PCU Term – 1M Use – 1M
c)	Define Highway Capacity. Definition –2M
d)	List out the factors affecting Level of Service. Two factors – 2M
e)	Why is Parking data analysis important? Importance – 2M
f)	Name two traffic control devices. Any two devices – 2M
g)	List two sources of noise pollution in traffic. — 2M
h)	Draw Stop and Give-Way Signs. Stop sign – 1M Give way sign – 1M
i)	Write the purpose of lane marking. Purpose – 2M
j)	What is a road safety audit? RSA – 2M

		PART –B (5 × 10 = 50M)
2	a)	Enumerate the methods of Traffic volume data collection. Methods – 5M
	b)	Explain the speed data collection method. Explanation – 5M
3	a)	Draw the relationship among Speed, Flow and Density. How it is used in Capacity Analysis? Relationship Diagram – 4M Uses – 1M
	b)	Discuss and interpret speed data. Presentation with neat diagrams. Discussion – 1M Interpret – 2M Diagram – 2M
4	a)	Explain the concept of Level of Service (LOS). Describe the six levels of service used in highway design. Concept – 1M

		LOS – 4M
	b)	Discuss the importance of highway capacity and LOS in traffic engineering and planning. Importance of Capacity – 2.5M Importance of LOS – 2.5M
5	a)	What are traffic regulations? Explain their importance in ensuring road safety and efficiency. Regulations – 1M Importance – 4M
	b)	Explain the traffic laws in regulation of traffic. Explanation – 5M
6	a)	Explain different types of parking. Types – 5M
	b)	Discuss about Parking Index and Parking Turnover. Parking Index – 2.5M Turnover – 2.5M
7	a)	Describe the current traffic situation in urban India. What are the major challenges and trends observed? Current Situation – 2.5M Challenges – 2.5M
	b)	Suggest effective measures to improve traffic conditions in Indian cities Measures – 5M
8	a)	What is noise pollution? What are its causes in urban traffic and how can it be reduced? Definition – 1M Causes – 4M
	b)	What are the causes of air pollution due to traffic? Discuss the effective control measures to reduce its impact. Causes – 2.5M Measures – 2.5M
9	a)	How the road signs are classified? Explain with neat sketches. Classification – 2M Sketches – 3M
	b)	Discuss the regulatory signs in traffic control and road safety. Regulatory Signs – 5M
10		Explain the various types of road markings commonly used. What are the various uses of each? Types – 10M
11	a)	Explain the causes of Accidents. How they can be reduced? Causes – 2.5m Measures – 2.5M
	b)	Explain the Highway Safety Problems in Urban Areas. Problems – 5M

Key

	PART – A (2 × 10 = 20M)
1. a)	Define Time Mean Speed and Space Mean Speed. Time Mean Speed is the **average of the speeds of individual vehicles** passing a point on the roadway **over a specified period of time**. Space Mean Speed is the **average speed of vehicles measured over a section of the road**, considering the **time each vehicle takes to travel a known distance**.
b)	What do you understand by the term PCU? Why is it used? A **Passenger Car Unit (PCU)** is a *traffic flow conversion factor* used to express different types of vehicles (buses, trucks, autos, two-wheelers, bicycles, etc.) in terms of an **equivalent number of passenger cars**. Each vehicle type is assigned a **PCU value** based on how much it affects traffic flow compared to a standard passenger car.
c)	Define Highway Capacity. **Highway Capacity** is the *maximum number of vehicles* (or passenger car units, PCUs) that can **reasonably be expected** to pass a given **section of a road or lane** in **one direction**, or in **both directions**, **during a specified time period**, **under prevailing roadway, traffic, and control conditions**.
d)	List out the factors affecting Level of Service. • Traffic volume (veh/hr or PCU/hr) • Speed of vehicles • Traffic composition • Headways and gaps • Overtaking and passing opportunities • Driver behaviour and aggressiveness • Peak-hour variations
e)	Why is Parking data analysis important? To Understand Parking Demand and Supply To Reduce Traffic Congestion To Design Efficient Parking Facilities
f)	Name two traffic control devices. Traffic signals Traffic signs
g)	List two sources of noise pollution in traffic. • Vehicle engine and exhaust noise • Tyre–road interaction noise
h)	Draw Stop and Give-Way Signs. 
i)	Write the purpose of lane marking. • **To separate traffic lanes** moving in the same or opposite directions. • **To guide drivers** on the correct path—especially at curves, intersections, and complex road sections. • **To improve safety** by reducing side-swipes, lane drifting, and head-

	on collisions. • **To regulate overtaking and lane changing** (
j)	What is a road safety audit? **Road Safety Audit (RSA)** is a **formal, systematic, and independent examination of a road project**—either existing or in the planning/design stage—to identify potential safety issues and suggest improvements.

PART –B (5 × 10 = 50M)		
2	a)	Enumerate the methods of Traffic volume data collection. 1. Manual Count Method • Observers count vehicles using tally sheets or electronic hand counters. 2. Automatic Traffic Counters • Pneumatic tube counters • Inductive loop detectors • Magnetic sensors • Piezo-electric sensors 3. Video-based Traffic Counting • CCTV or mobile cameras record traffic; later analyzed manually or by software. 4. GPS / Mobile App-based Counting • Smartphone applications and GPS devices used to record vehicle movements. 5. Drone-based Traffic Survey • UAVs capture high-resolution aerial videos for automated volume estimation.
	b)	Explain the speed data collection method. 1. **Select a suitable location:** o Straight section of the road o Free from intersections, curves, or obstructions 2. **Mark the observation points:** o Mark **two points on the road** with a **known distance** LLL (e.g., 20–50 m apart) 3. **Observe the vehicle:** o Stand at a suitable vantage point using the **Enoscope**. o Start the **stopwatch** when the **front of the vehicle passes the first point**. o Stop the **stopwatch** when the **front of the vehicle passes the second point**. 4. **Record time** for each vehicle. 5. **Calculate speed:** Speed (km/h)=Distance (m)/Time (s)×3.6
3	a)	Draw the relationship among Speed, Flow and Density. How it is used in Capacity Analysis?

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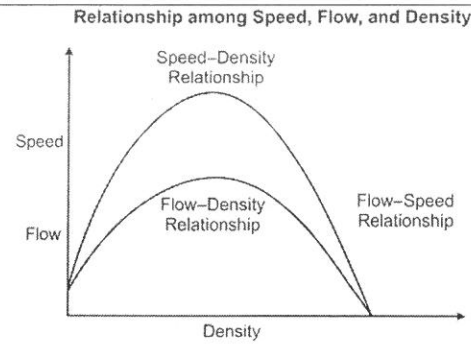
<tr><td></td><td></td><td>


Capacity analysis determines the maximum number of vehicles a road can handle efficiently.
1. Determine free-flow speed (vfv_fvf) and jam density (kjk_jkj).
2. Plot flow vs. density curve (fundamental diagram).
3. Identify critical density (kck_ckc) where flow is maximum.
4. Maximum flow at kck_ckc gives the road capacity (qmaxq_\text{max}qmax).
5. Compare actual flow with capacity to assess level of service.
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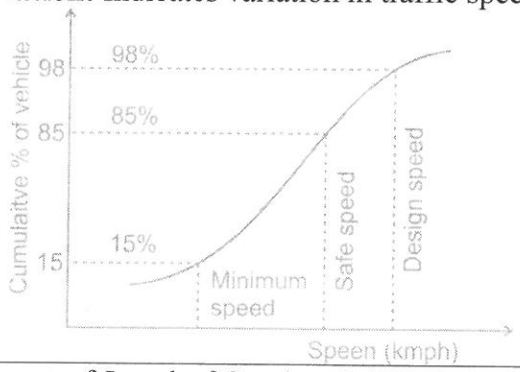
Discuss and interpret speed data. Presentation with neat diagrams.
• Mean Speed: Indicates general traffic flow speed.
• Median Speed: Represents central tendency, less affected by outliers.
• Mode Speed: Most frequently occurring speed.
• Percentile Speed (e.g., 85th percentile):
  • Important for setting speed limits.
  • 85th percentile = speed at which 85% of vehicles travel at or below.
• Standard Deviation: Indicates variation in traffic speeds.


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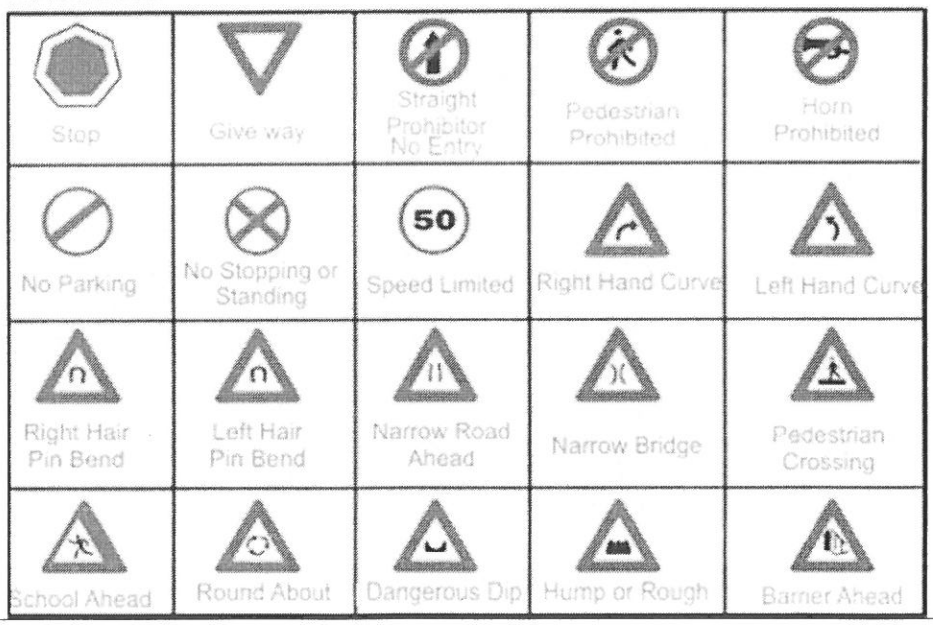
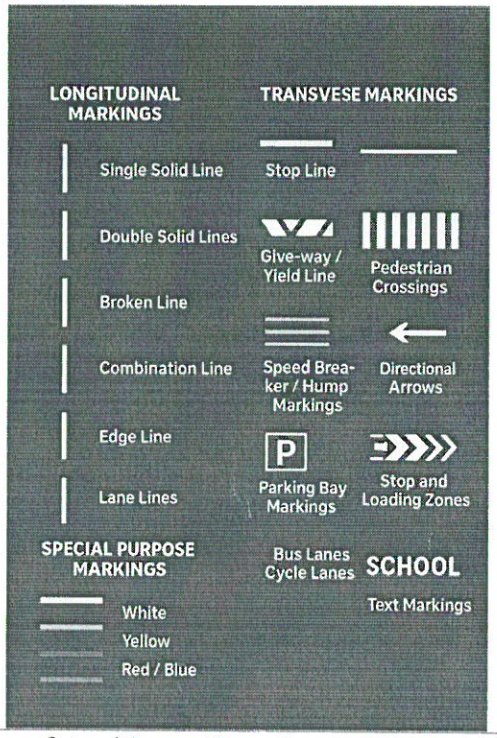
<tr><td>4</td><td>a)</td><td>
Explain the concept of Level of Service (LOS). Describe the six levels of service used in highway design.
Level of Service (LOS) is a qualitative measure used in transportation engineering to describe the operational conditions of a roadway or intersection. It reflects traffic flow, speed, travel time, congestion, and driver comfort. Essentially, LOS indicates how well a road or facility is functioning from the perspective of the driver. It helps engineers assess capacity, efficiency, and quality of service and make decisions about road design, improvements, and traffic management.
<table>
<tr><td>LOS</td><td>Speed</td><td>Density</td><td>Delay</td><td>Traffic Flow</td></tr>
<tr><td>A</td><td>Very High</td><td>Very Low</td><td>Minimal</td><td>Free Flow</td></tr>
<tr><td>B</td><td>High</td><td>Low</td><td>Slight</td><td>Stable, free flow</td></tr>
</table>
</td></tr>
</table>

		C Moderate Moderate Noticeable Stable flow D Low High Significant Approaching unstable E Very Low Very High Severe Near capacity, unstable F Stop-and-Go Maximum Extreme Breakdown, forced flow
	b)	Discuss the importance of highway capacity and LOS in traffic engineering and planning. • **Design roads efficiently:** Ensure road width, number of lanes, and other geometric features are adequate to handle expected traffic volumes. • **Prevent congestion:** By comparing actual traffic volumes with capacity, engineers can identify bottlenecks and plan improvements. • **Plan infrastructure investments:** Determine whether a new road, lane expansion, or traffic management strategy is needed. • **Optimize traffic flow:** Helps in implementing measures such as signal timing, ramp metering, and intelligent transportation systems (ITS). • **Ensure safety:** Roads operating beyond capacity have more stop-and-go conditions, increasing crash risk.
5	a)	What are traffic regulations? Explain their importance in ensuring road safety and efficiency. **Traffic regulations** are a set of **rules, laws, and guidelines established by government authorities** that govern the behavior of road users, including drivers, pedestrians, and cyclists. • **Speed limits** – Maximum or minimum speeds on different types of roads. • **Traffic signals and signs** – Stop signs, give-way signs, lane markings, and traffic lights. • **Right-of-way rules** – Who has priority at intersections, pedestrian crossings, or roundabouts. • **Lane discipline** – Rules about overtaking, lane usage, and turning. • **Parking rules** – Restrictions on where vehicles can park or stop. • **Vehicle requirements** – Licensing, registration, insurance, and fitness standards. • **Pedestrian and cyclist regulations** – Crossing rules, helmet laws, and dedicated lanes.
	b)	Explain the traffic laws in regulation of traffic. **Traffic laws in regulation of traffic** are the **legal rules established by authorities to control, manage, and regulate the movement of vehicles and pedestrians on roadways**. These laws provide a **structured framework for safe, efficient, and orderly road use**. Violating these laws usually attracts **penalties, fines, or legal consequences**.
6	a)	Explain different types of parking. 1. **On-Street Parking** o Vehicles are parked **along the sides of streets or roads**. o Can be **parallel, angled, or perpendicular** depending on road width and design. o Examples: Parallel parking on city streets. o Advantages: Convenient for short-term stops.

		○ Disadvantages: Reduces road width and may cause congestion. 2. **Off-Street Parking** ○ Vehicles are parked **in areas away from the main roadway** such as parking lots, garages, or basements. ○ Examples: Shopping mall parking lots, multi-story parking garages. ○ Advantages: Reduces on-street congestion. ○ Disadvantages: Requires additional land and infrastructure.
	b)	Discuss about Parking Index and Parking Turnover. **Parking Index (PI)** **Definition:** Parking Index is a **measure of parking demand relative to parking supply**. It indicates whether a parking facility or area is **underutilized, fully utilized, or overutilized**. **Formula:** Parking Index (PI)=Actual Number of Parked Vehicles/Total Parking Capacity **Parking Turnover (PT)** **Definition:** Parking Turnover measures the **number of vehicles using a parking space over a given period**, typically per day. It indicates **how frequently parking spaces are used**. **Formula:** Parking Turnover (PT)=Total Number of Vehicles Using the Parking Space/Total Number of Parking Spaces
7	a)	Describe the current traffic situation in urban India. What are the major challenges and trends observed? **congestion, slow speeds, inefficiency** Impacts of this poor mobility include: • Wasted time — lost productive hours, delayed commutes. • Increased fuel consumption, higher pollution and emissions — especially when vehicles idle or operate in congested flow. • Poor quality of life: stress, unpredictability, lower reliability of travel times, difficulty in planning day-to-day movement
	b)	Suggest effective measures to improve traffic conditions in Indian cities **Improve Public Transportation** • **Expand and modernize public transport systems**: Metro, buses, BRT (Bus Rapid Transit), and suburban rail networks. • **Encourage usage**: Affordable fares, frequency, reliability, and comfort. • **Integrate multi-modal transport**: Seamless transfers between metro, buses, taxis, and bike-sharing systems. • **Benefits:** Reduces private vehicle dependence, lowers congestion, and reduces pollution. **2. Traffic Management and Control** • **Intelligent Traffic Management Systems (ITMS)**: Adaptive traffic signals, real-time traffic monitoring, and automated incident detection. • **Synchronize traffic signals**: Reduce stop-and-go conditions and improve traffic flow. • **Enforce traffic regulations strictly**: Speed limits, lane discipline, no-parking zones.

		• **Roundabouts and signal optimization**: For smoother traffic at intersections. **3. Road Infrastructure Improvement** • **Widening and upgrading roads**: Adding lanes where feasible and improving road quality. • **Constructing flyovers and underpasses**: To eliminate bottlenecks at intersections and rail crossings. • **Develop dedicated lanes**: For buses, bicycles, and high-occupancy vehicles (HOV). • **Proper signage and markings**: Reduce confusion and accidents.
8	a)	What is noise pollution? What are its causes in urban traffic and how can it be reduced? **Noise pollution** is the presence of **unwanted or harmful sound in the environment** that **disturbs human life, health, and well-being**. In urban areas, it is a major environmental concern, particularly due to traffic Urban traffic is a primary source of noise pollution due to: 1. **Vehicle Engine Noise** ○ Internal combustion engines of cars, buses, trucks, and motorcycles produce significant sound. 2. **Honking and Horns** ○ Frequent and unnecessary honking adds to noise levels, especially at intersections and congested areas. 3. **Tyre-Road Interaction** ○ Noise generated from friction between vehicle tires and road surfaces. ○ Rough or poorly maintained roads amplify this effect. 4. **Brake and Gear Noise** ○ Older or poorly maintained vehicles produce additional noise from brakes and gear systems. 5. **Traffic Congestion** ○ Stop-and-go traffic increases honking, engine noise, and gear changes, contributing to higher sound levels.
	b)	What are the causes of air pollution due to traffic? Discuss the effective control measures to reduce its impact. **Air pollution due to traffic** is a major environmental concern in urban areas. Vehicles emit **pollutants** that degrade air quality, affect human health, and contribute to climate change. Let's discuss the **causes** and **control measures** in detail. Traffic-related air pollution arises from **vehicle emissions** and **traffic conditions**. The main causes include: **A. Vehicle Emissions** • **Exhaust gases**: Vehicles emit **carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons (HC), particulate matter (PM), and sulfur dioxide (SO2)**. • **Two-wheelers and diesel vehicles**: Older two-stroke engines and diesel vehicles produce higher particulate emissions. • **Incomplete combustion**: Poorly maintained engines release more pollutants. **B. Traffic Congestion** • **Stop-and-go traffic** leads to **idling engines**, increasing fuel

		consumption and emissions. • **Frequent acceleration and braking** produce higher NOx, CO, and HC emissions. **C. Fuel Quality** • **High-sulfur fuels** and adulterated fuels increase emissions. • Poor-quality gasoline or diesel leads to **more smoke and particulate matter**. **D. Vehicle Population** • Rapid increase in the **number of vehicles**, especially private cars and two-wheelers, contributes to higher overall emissions.
9	a)	How the road signs are classified? Explain with neat sketches. 
	b)	Discuss the regulatory signs in traffic control and road safety. 

10		Explain the various types of road markings commonly used. What are the various uses of each? 
11	a)	Explain the causes of Accidents. How they can be reduced? **1. Human Factors (Major Cause)** • **Speeding:** Driving above speed limits reduces reaction time and increases accident severity. • **Drunken driving:** Alcohol impairs judgment, reflexes, and coordination. • **Aggressive driving:** Tailgating, overtaking recklessly, and road rage. • **Lack of experience:** Young or inexperienced drivers may misjudge situations. **2. Vehicle Factors** • **Mechanical failures:** Brake failure, tire blowouts, or steering problems. • **Poor maintenance:** Worn-out tires, faulty lights, or defective signaling systems. • **Overloading:** Excess weight affects vehicle control and braking. **3. Road and Environmental Factors** • **Poor road conditions:** Potholes, uneven surfaces, or unmarked roads. • **Bad lighting:** Poor visibility at night increases accident risk. • **Sharp curves or blind spots:** Roads designed without proper safety features. • **Weather conditions:** Rain, fog, snow, or ice make roads slippery and reduce visibility.
	b)	Explain the Highway Safety Problems in Urban Areas. **1. High Traffic Density** Urban roads often carry a mix of **cars, buses, trucks, two-wheelers, and pedestrians**. Congested roads increase **conflicts between vehicles** and reduce reaction

		time, leading to accidents. Traffic jams may cause **rear-end collisions** and aggressive driving behavior. **2. Pedestrian Safety Issues** High number of pedestrians crossing roads without **proper crossings**. Lack of **footpaths or sidewalks**, forcing pedestrians to walk on roads. Children and elderly are especially vulnerable. **3. Mixed Traffic and Road User Conflicts** Presence of **slow-moving vehicles, bicycles, auto-rickshaws, and motorcycles** alongside fast-moving cars. Sudden lane changes and overtaking increase chances of collisions. Lack of **segregated lanes** for different vehicle types.