

6E7122	Roll No. _____	[Total No. of Pages : 4]
	6E7122	
	B.Tech. VI-Sem. (Main/Back) Examination, April/May - 2026 Civil & Infrastructure Engineering 6CE4-02 Structural Analysis-II	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt All Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions in Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Define the Castigliano's Theorem.
2. What will be the strain energy due to torsion or twisting moment in a member?
3. What do you mean by lack of fit in redundant frame?
4. Write down the use of influence line diagram.
5. When a series of wheel loads move along a girder, what is the condition for getting maximum bending moment under any one point load?
6. Calculate the static degree of indeterminacy of two hinged arch and fixed arch.
7. Differentiate between the structural behavior of a beam and an arch for given span.
8. State the two reasons for unsymmetrical bending.
9. Define shear centre.
10. What will be the horizontal shear in any interior column in the portal method of analysis if the horizontal shear in exterior column is 5 kN.

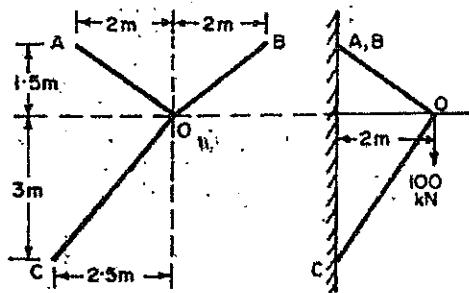
PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Using Castigliano's theorem, calculate the central deflection of a simply supported beam carrying a UDL w per unit length over whole span.
2. Derive the expression for strain energy due to axial force and bending moment.
3. Make neat diagram of the influence lines for B.M. at a section 3m from one end of a simply supported beam, 12m long. Use the diagram to calculate the maximum bending moment at this section due to a uniform distributed rolling load, 5 m long of 2 kN per meter intensity
4. Prove the Muller-Breslau Principle.
5. A parabolic arch hinged at the springings and the crown has a span of 20m. The central rise of the arch is 4m. It is loaded with a UDL of intensity 2kN/m on the left 8m length. Calculate
 - a) The direction and magnitude of reaction at the hinges
 - b) The bending moment, normal thrust and shear at 4m from the left end.
6. Write down the assumptions of cantilever and portal methods of analysis of frames under lateral loads.
7. The two views of a tripod bracket shown in the below. All connections are pinned. Find the forces in magnitude and nature in the three members due to a vertical load of 100 kN acting at O.



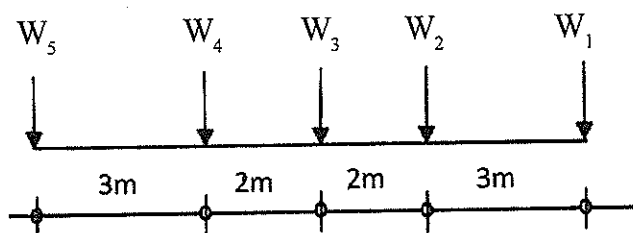
PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

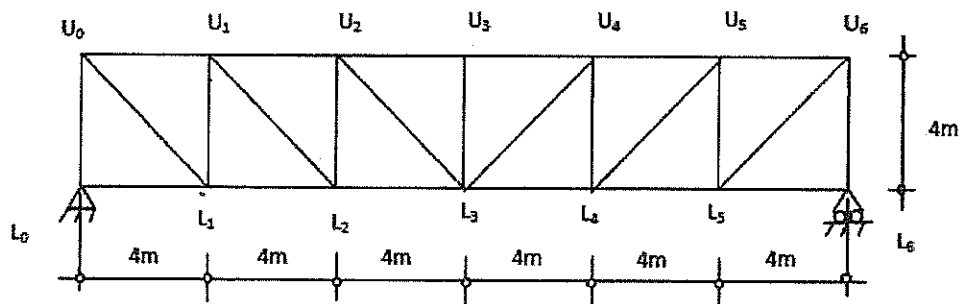
Attempt any Three questions.

(3×10=30)

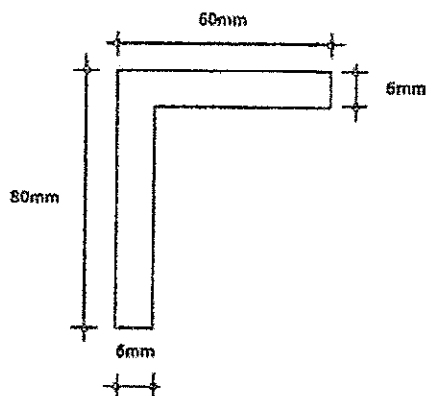
1. The load system shown below crosses a beam simply supported over a span of 24 m. Determine the maximum B.M. and S.F. at a station 8 m from the left hand end. ($W_1=15\text{kN}$, $W_2=25\text{kN}$, $W_3=20\text{kN}$, $W_4=20\text{kN}$, $W_5=10\text{kN}$)



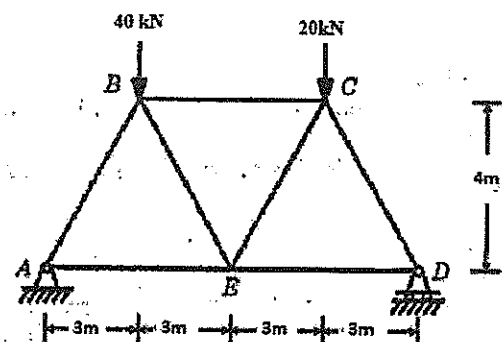
2. Draw the influence line diagram for members U_1L_1 , U_1L_2 , L_1L_2 and U_1U_2



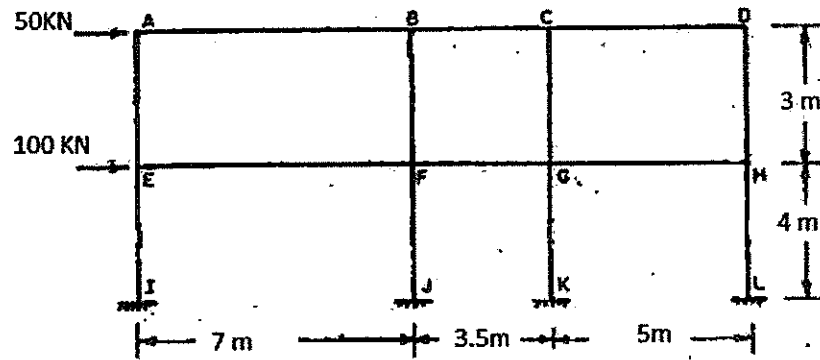
3. Determine the principal moments of inertia for an unequal angle section shown in below of size $80 \times 60 \times 6$.



4. Determine the vertical deflection of the point E of the truss given below. Assume bars of same cross sectional area of 3000 mm^2 and $E = 2 \times 10^2 \text{ N/mm}^2$.



5. Analyse the building frame to calculate horizontal shears, moments at the end of columns and beam and shear in beams, subjected to horizontal forces, as shown below



6E7123	Roll No. _____	[Total No. of Pages : 2]
	6E7123	
	B.Tech. VI - Sem. (Main/Back) Examination, April/May - 2026 Civil & Infrastructure Engineering 6CE4-03 Environmental Engineering	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Define design period.
2. What is per capita demand?
3. Define break-point chlorination.
4. Define BOD and COD.
5. What is self - cleansing velocity?
6. Differentiate between combined and separate systems of sewerage.
7. What is the purpose of septic tank?
8. What is difference between primary and secondary air pollutants?
9. If two noise sources each producing 60 dB are operating simultaneously, find the resultant noise level.
10. Define air quality index.

PART - B

(Analytical / problem solving questions)

Attempt any Five questions.

(5×4=20)

1. Describe various types of water demand and the factors affecting them.
2. Draw a neat layout of a conventional water treatment plant and explain the function of each unit.
3. Explain different types of settling in a sedimentation tank. Discuss the factors affecting the efficiency of a sedimentation tank.
4. Describe the various layouts of water distribution pipes. Mention the merits and demerits of each.
5. Derive the first-stage BOD equation. Explain why the 5-day BOD at 20°C is taken as a standard?
6. What are the different types of sewage treatment systems? Discuss their advantages and disadvantages.
7. Explain the various control measures adopted for air pollution.

PART - C

(Descriptive / Analytical / problem solving / design questions)

Attempt any Three questions.

(3×10=30)

1. Design a rectangular sedimentation tank to treat 5 MLD of water. Assume a detention period of 3 hours and a flow-through velocity of 0.3 m/minute. Also check the surface loading rate.
2. Explain the process of water filtration. Compare slow sand filters and rapid sand filters in detail.
3. The 5-day BOD of a sewage sample at 20°C is 250 mg/l. Calculate its ultimate BOD. Assume the deoxygenation constant (K) at 20°C as 0.1 per day. Also find the 3-day BOD at 27°C.
4. Design a circular sewer to carry a peak discharge of 1.5 m³/sec when flowing half-full. The available ground slope is 1 in 1000. Assume Manning's $n = 0.013$.
5. Explain the disposal of sewage by dilution and irrigation sewage farming.

6E7124	Roll No. _____	[Total No. of Pages : 3]
	6E7124	
B.Tech. VI - Sem. (Main/Back) Examination, April/May - 2026 Civil and Infrastructure Engineering 6CE4-04 Design of Steel Structures		

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A. Attempt any Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

Answer all questions are compulsory.

(10×2=20)

1. Write any two advantages of steel as structural material.
2. Explain the web crippling in beam.
3. Name any two theorems of plastic analysis.
4. What is the difference between pitch and gauge for bolted connection”?
5. Name any four types of tension members.
6. What is the plastic hinge?
7. Explain how column caps are similar to column base plates.
8. Explain the stiff bearing length in plate girder.
9. Name any four components of plate girder.
10. Why the portal bracings are provided in truss girder bridge?

PART - B

(Analytical/problem solving questions)

Attempt any Five questions.

(5×4=20)

1. Find the shape factor of triangular section of base b and height h .
2. Calculate the strength of a 20 mm diameter bolt of grade 4.6 for the double cover butt joint, each of the cover plate being 8 mm thick and the main plates to be jointed are 12 mm thick.
3. What is Shear lag? Explain the types of failures in tension member.
4. Explain the typical arrangement of gantry girder and crane girder with diagram.
5. What do you understand by outstand of web stiffeners? How does a plate girder derive post-buckling strength?
6. Differentiate between lacing and batten in compression members.
7. Draw a neat diagram of bolted gusset base and explain all the components.

PART - C

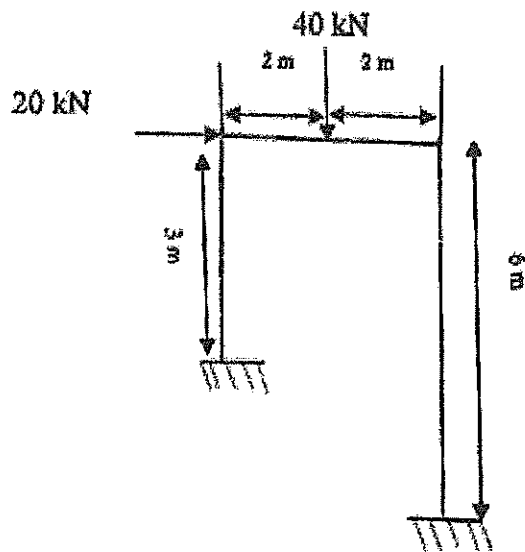
(Descriptive / Analytical / Problem solving / Design questions)

Attempt any Three questions.

(3×10=30)

1. A column ISHB 350 @ 661.2 N/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M 15 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connections.
2. A diagonal member of a roof carries a maximum pull of 300 kN. Design the section and its connection with a 16 mm thick gusset plate. The length of the connection is limited to 340 mm. Design the lug angles also if required. Use steel is of grade Fe 410 and bolts of grade 4.6.
3. A gantry girder with manually operated travelling crane, to be used in an industrial building, for the following data ;
Self - weight of the crane girder excluding trolley : 200 kN
Self - weight of the trolley, hook, electric motor, etc. : 40 kN
Crane capacity : 200 kN
Approximate minimum approach of the crane hook to the Gantry Girder : 1.20 m
Diameter of crane wheels : 150 mm, Wheel base : 3.5 m
c/c distance b/w gantry rails : 16 m, c/c distance b/w columns (span of gantry girder) : 8 m Self - weight of rail section : 300 N/m.
Grade of steel Fe 415. Find the suitable trial sections for gantry girder.

4. Design a welded plate girder 25 m in span and laterally restrained throughout. It has to support a uniform load of 100 kN/m throughout the span exclusive of self-weight. Design the web of girder without intermediate transverse stiffeners. The steel for the flange and web plates is of grade Fe 410.
5. Find out the fully plastic moment in the portal frame show in fig. The frame has a uniform cross section throughout.



6E7125	Roll No. _____	[Total No. of Pages : 3]
	6E7125	
B.Tech. VI - Sem. (Main/Back) Examination, April/May - 2026 Civil & Infrastructure Engineering 6CE4-05 Estimating & Costing		

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Define 'estimate' and state its objectives in construction projects.
2. Differentiate between measurement sheet and abstract sheet.
3. What is a Bill of Quantities (BOQ)? State its purpose.
4. What is a supplementary estimate? When is it prepared?
5. Define preliminary and original estimates with one example each.
6. What is a Current Schedule of Rates (C.S.R)? State its importance.
7. Define 'task for average artisan' and its role in rate analysis.
8. How is earth work quantity calculated for road construction?
9. Define depreciation. State any two methods of calculating it.
10. What is sinking fund? How is it used in building valuation?

PART - B

(Analytical / problem solving questions)

Attempt any Five questions.

(5×4=20)

1. Explain the two methods of preparing detailed estimate i.e. centre line method and long-wall short-wall method. What are their advantages and disadvantages.
2. A trench of dimensions **10m × 5m × 1.5m** is to be excavated for foundation purposes. Calculate the total quantity of earthwork required. Additionally, consider **10% extra volume** for compaction loss.
3. What is meant by Analysis of Rates. What is the purpose of Rate-analysis. Explain the various factors on which rate of an item depend.
4. Explain the purpose and importance of estimates in construction projects. What are the different principles of estimating?
5. Calculate the quantity of brickwork (in m³) for a wall 6 m long, 3 m high and 0.30m thick. Deduct one window opening of 1.2 m × 1.5 m. Use standard mode of measurement.
6. A building has a plinth area of 120 m². The plinth area rate is Rs.18,500/m². Estimate the total cost of construction. Also calculate the revised cost if the rate increases by 12%.
7. Define valuation and explain its purposes.

PART - C

(Descriptive / Analytical problem solving / Design questions)

Attempt any Three questions.

(3×10=30)

1. What are the different types of estimate? Describe each one of them with their uses, merits and demerits in context to each other.
2. A building was constructed 8 years ago at a cost of Rs. 12,00,000. The life of the building is 60 years and scrap value is 10% of the cost. Calculate : a) Annual depreciation by Straight-Line Method b) Present value (book value) of the building after 8 years.
3. Write the detail specification for the following items :
 - a) Damp Proof Course
 - b) Brickwork

4. A commercial building has a plinth area of 2800 sqm, and the plinth are rate is Rs. 12,500 per sqm. Include additional costs for Special architectural design @ 2%, Water supply and sanitary @ 4%, Electrical installation @ 12%, Other services @ 5%, Contingencies @ 3%, Supervision charges @ 7%. Calculate the total estimated cost of the building project.
5. Explain the following terms :
- a) Year's purchase
 - b) Measurement Book
 - c) Capitalized Value
 - d) Contingency Charges
 - e) Plinth Area
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6E7121	Roll No. _____	[Total No. of Pages : 2]
	6E7121	
	B.Tech. VI-Sem. (Main/Back) Examination, April/May- 2026 Civil and Infrastructure Engineering 6CE3-01 Wind and Seismic Analysis	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt All Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions in Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. What do you understand by building symmetry and asymmetry in building forms?
2. Explain strong column weak beam analogy of framed structure.
3. Define aspect ratio of a building.
4. What are the various modes of a masonry structure under earthquake?
5. Define epicenter and epicentral distance.
6. Differentiate between load bearing structure and framed structure.
7. Explain load flow concept in detail.
8. What is Moment resisting frame system?
9. What is peak gust? Explain .
10. How many number of earthquake zones are existed in India?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Define Shear wall. What are the functions of shear wall?
2. Write a note on different lateral load resisting systems.
3. What is centre of mass and centre of rigidity for any structure? What are the effects on structural stability if they do not locate at the same point?
4. Write a short note on Earthquake resistant construction of building.
5. Write down the steps to obtain design wind pressure at any height above mean ground level as per the provisions of IS 875 Part 3.
6. Explain in detail various types of loads acting on a building or structure and mention their relevant codes.
7. What do you mean by torsional irregularity? Explain in brief.

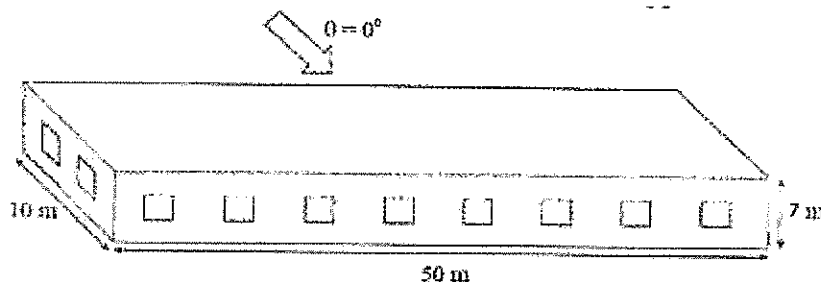
PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. What are the different configurations of the building? Explain any two.
2. Explain the concept of special confining reinforcement. Explain the various requirements for a column through neat sketch as per IS 13920.
3. Calculate wind pressure and design force on walls and roof of a rectangle building having plan dimensions 10×50 m and Height 7 m. as shown in figure. The building is situated in Mohali in an upcoming Institutional complex on a fairly level topography. Walls of building have 22 opening of 1.5×1.5 m size. The building has a flat roof supported on load bearing walls.



4. Explain the ductile detailing in column and beam connections.
5. Describe the calculation procedure of an earthquake loads on framed structures.

6E7130	Roll No. _____	[Total No. of Pages : 2]
	6E7130	
	B.Tech. VI-Sem. (Main/Back) Examination, April/May - 2026 Civil and Infrastructure Engineering 6CE5-15 Rock Engineering (Elective - IV)	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all ten questions from Part A, Five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/Calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Discuss Gouge in Jointed Rocks.
2. Write in short the Hoek and Brown Criterion.
3. Write relation between RMR and Q System.
4. Discuss effects of Joint Inclination.
5. How rocks are classified as per Geological classification system?
6. What are various index properties of rocks?
7. Bring out the effect of joint orientation on the strength of jointed rock.
8. What is the effect of confining stress on stress-strain characteristics of rocks?
9. State the modes of rock slope failure.
10. List various types of rock bolts?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Explain the Field Shear Test in Field with Fig.
2. Discuss Flexural Strength Test.
3. Explain the Kulatilake methodology for Unconfined Strength of Rocks.
4. Write about Brazilian Test.
5. Explain the Ramamurthy Strength Criterion of Rocks.
6. Discuss in detail the basis and factors considered in RMR classification system-of rocks
7. Discuss Mohr-Coulomb failure criterion for rocks.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. Explain the Triaxial Shear test in lab with Fig.
 2. Explain different methods to find the Unconfined Strength of Jointed Rocks.
 3. Discuss the method of Rocks to Find Deformability by Plate Load Test.
 4. Discuss Hoek and Brown empirical criterion of failure for rocks.
 5. Discuss in detail the Q-system of classification of rocks.
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6E7128	Roll No. _____	[Total No. of Pages : 3]
	6E7128	
	B.Tech. VI-Sem. (Main/Back) Examination, April/May - 2026 Civil Infrastructure Engineering 6CE5-13 Traffic Engineering and Management (Elective-III)	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/Calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. What PIEV means?
2. Listout two uses of O and D survey
3. Define spot speed and spot maps.
4. List various types of volume counts
5. Design and draw a typical parking inventory diagram with all its components.
6. Classify the various intersections.
7. Explain the 3E's concept of preventive measures of road accident.
8. Explain TSM.
9. Write a short note on level of service in traffic analysis.
10. Summarize the objectives of traffic surveys.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Classify the different methods of presenting O and D data.
2. Explain the various methods of Off-street parking facilities.
3. Discuss the various methods of recording accidents.
4. Explain the advantages and disadvantages of rotary intersection.
5. Explain various types of road markings commonly used with neat sketches.
6. Design a lighting system for the following condition:
 - a) Street width = 15 m
 - b) Mounting height = 7.5 m
 - c) Lamp size = 6000 lumen
 - d) Luminaries type = II
 - e) Spacing between lighting units to produce average lux = 6.0
7. **Write in detail about**
 - a) Traffic congestion studies
 - b) Effect of traffic congestion

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. What are the various traffic studies in traffic engineering? Draw its flow chart.
2.
 - a) Explain in detail the various design elements of rotary type of intersection based on IRC standards with neat sketches
 - b) A rotary is proposed in a rural area at a location where two four lane divided roads meet each other. The peak hour traffic flow is as follows.

Name of the arm feeding traffic to the intersection	Traffic Flow in PCUs/hour		
	Left	Straight	Right
N	350	450	250
E	450	490	300
S	275	400	390
W	390	500	275

Design a rotary for the intersection.

3. Explain the collision and condition diagram for four are intersection.
 4. Explain the following
 - a) Intelligent Transport system for traffic management
 - b) Traffic segregation methods
 5. Explain in detail about the different types of Traffic Demand Management techniques.
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