

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.

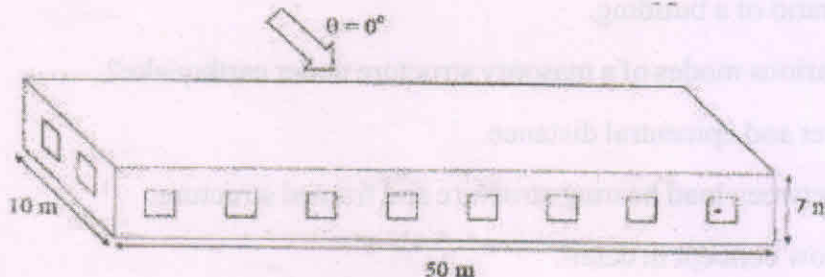
PART - C

(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.

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.

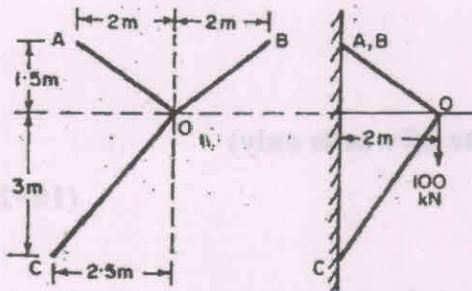
PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

- Using Castigliano's theorem, calculate the central deflection of a simply supported beam carrying a UDL w per unit length over whole span.
- Derive the expression for strain energy due to axial force and bending moment.
- 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
- Prove the Muller-Breslau Principle.
- 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
 - The direction and magnitude of reaction at the hinges
 - The bending moment, normal thrust and shear at 4m from the left end.
- Write down the assumptions of cantilever and portal methods of analysis of frames under lateral loads.
- 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.



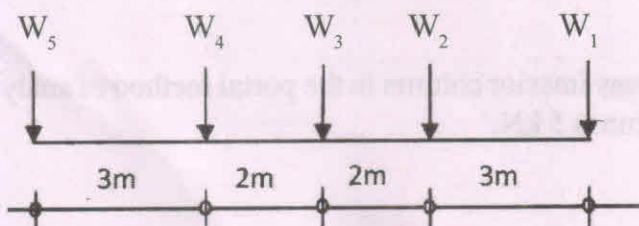
PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

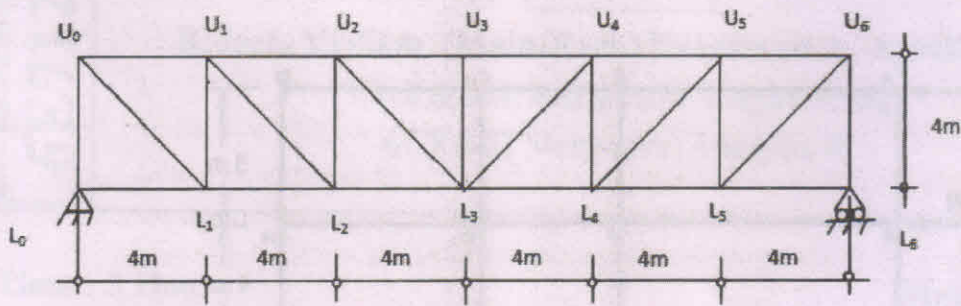
Attempt any Three questions.

(3×10=30)

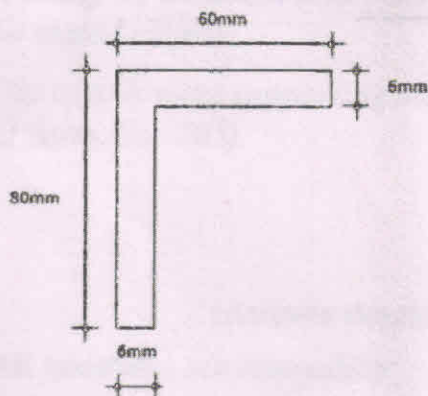
- The load system shown below crosses a beam simply supported over a span of 24 m. Determine the maximum B.M. and S.F. at a station 8 m from the left hand end. ($W_1=15\text{kN}$, $W_2=25\text{kN}$, $W_3=20\text{kN}$, $W_4=20\text{kN}$, $W_5=10\text{kN}$)



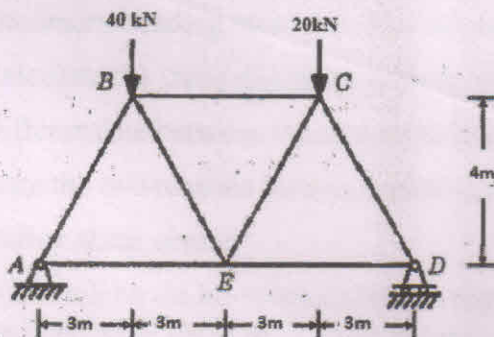
2. Draw the influence line diagram for members U_1L_1 , U_1L_2 , L_1L_2 and U_1U_2



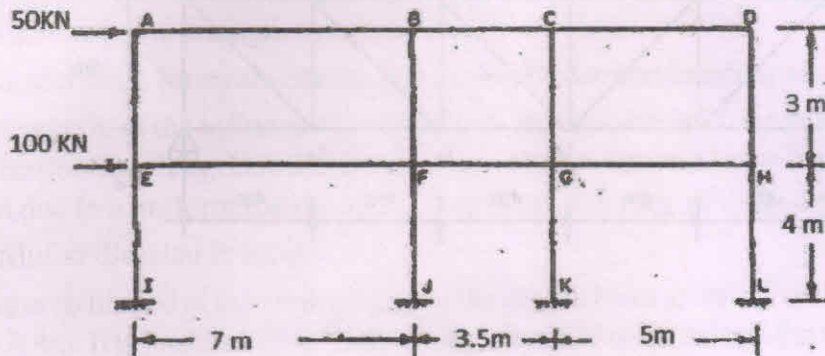
3. Determine the principal moments of inertia for an unequal angle section shown in below of size $80 \times 60 \times 6$.



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 $1.5 \text{ m}^3/\text{sec}$ 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)

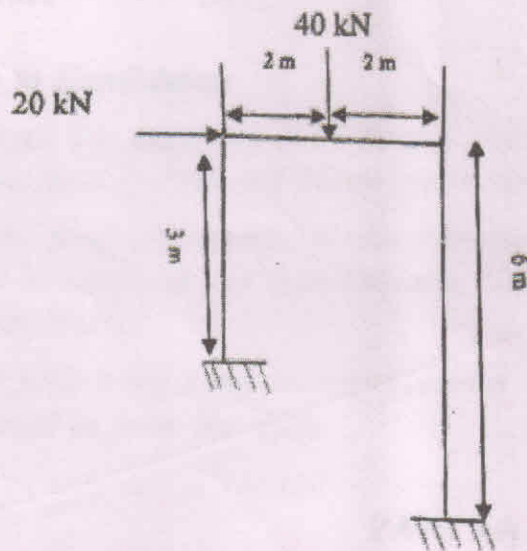
Attempt any Three questions.

(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 m^3) 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 m^2 . The plinth area rate is Rs.18,500/ m^2 . 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 area 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

6E7127	Roll No. _____	[Total No. of Pages : 2]
	6E7127	
	B.Tech. VI-Sem. (Main/Back) Examination, April/May - 2026 Civil and Infrastructure Engineering 6CE5-12 Solid and Hazardous Waste 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. Differentiate biodegradable and non-biodegradable waste with one example each.
2. State two factors influencing quantity of solid waste generation.
3. What are the components of proximate analysis of solid waste?
4. Define field capacity and state its significance in landfill design.
5. Differentiate between size reduction and volume reduction.
6. What is the function of a transfer station in SWM?
7. Define windrow composting and mention one advantage.
8. Differentiate between incineration and pyrolysis.
9. State any two characteristics of hazardous waste.
10. What is Extended Producer Responsibility (EPR)?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Explain factors affecting solid waste generation and their impact on quantity and composition.
2. Describe functional elements of solid waste management and explain their inter relationship.
3. Explain physical, chemical, and biological characteristics of solid waste and their importance in treatment selection.
4. A city is facing inefficient waste collection with frequent overflow of community bins. Analyze the problem and suggest an improved collection system.
5. Discuss biological treatment methods of solid waste and evaluate their suitability under Indian conditions.
6. A municipal authority wants to reduce landfill burden. Evaluate the role of waste hierarchy and 3R principles in achieving this goal.
7. An urban area is struggling with improper solid waste management leading to environmental and health issues. Identify key challenges and propose practical solutions.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. Critically evaluate the limitations of conventional solid waste collection and disposal systems in rapidly urbanizing regions of Rajasthan. Propose a technologically advanced, climate-resilient, and sustainable solid waste management framework suitable for arid and semi-arid conditions, considering resource constraints, seasonal variations, and local socio- economic factors.
2. Analyze the complete solid waste processing chain and justify the selection of appropriate treatment technologies based on waste characteristics, economic feasibility, and environmental considerations.
3. Evaluate the institutional and financial constraints faced by urban local bodies in solid waste management and suggest strategies for improving system efficiency.
4. Assess the environmental and operational challenges associated with landfill disposal of solid waste. Propose suitable measures for improving landfill performance and minimizing environmental impacts.
5. Discuss the role of circular economy principles in transforming traditional waste management practices. Evaluate how resource recovery and waste minimization strategies can enhance sustainability and reduce environmental impacts.

Total No. of Questions:

Total No. of Pages: 3

Roll No. _____

B.Tech. VI-Sem. (Main/Back) Exam 2026

Civil Engineering

6CE5-16 Geographic Information System & Remote Sensing (EI-IV)

6E7131

Time: 3 Hours

Maximum Marks: 70

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 missing may suitable be assumed and stated clearly. Units of quantities used/calculated must be stated clearly. Use of following supporting material is permitted during examination (As mentioned in form No. 2025

1 _____

2 _____

Part A (word limit 25)

- Q.1 Define the types of aerial photographs
- Q.2 Define relief displacement.
- Q.3 What is atmospheric window.
- Q.4 What is the principle of remote sensing.
- Q.5 Write the name of various platforms used in remote sensing and their altitude.
- Q.6 Define active and passive sensor.
- Q.7 Define spectral and spatial resolution.
- Q.8 What are SPOT satellite and which sensor are used for SPOT satellite.
- Q.9 Write the two limitations of remote sensing.
- Q.10 Write the name of the components of GIS.

10 x 2 = 20

Part B (word limit 100)

- Q.1 What is relief displacement in a vertical photograph? Derive the relation between the relief displacement and the height above datum with an appropriate diagram.
- Q.2 Discuss the interaction between electromagnetic radiation and the earth's surface.

- Q.3 What are spectral signatures and atmospheric windows? Explain their importance in remote sensing.
- Q.4 Explain orbital parameters of a satellite with suitable diagrams.
- Q.5 Discuss the characteristics of remote-sensing sensors such as spatial, spectral, temporal and radiometric resolution.
- Q.6 Explain the advantages of multi-date and multi-band satellite images.
- Q.7 Explain the role of GIS in water resource management and soil erosion studies.

5x4 = 20

Part C

- Q.1 Explain the concept of flight planning for aerial photography. Also discuss how maps and map substitutes can be prepared from aerial photographs and their practical uses.
- Q.2 Describe the different types of remote sensing satellites and their applications in earth observation.
- Q.3 Explain the important characteristics of remote sensing sensors, including spatial, spectral, radiometric, and temporal resolution, and discuss their significance.
- Q.4 What are multi-date and multi-band satellite images? Discuss their importance and advantages in environmental monitoring and resource management.
- Q.5 Describe the applications of Geographic Information System in water resource management, soil erosion analysis, and environmental monitoring.

3x10 = 30

6E1542

Roll No. _____

[Total No. of Pages : 3]

6E1542**B.Tech. VI-Sem. (Back) Examination, April/May - 2026****Civil Engg.****6CE4-02 Structural Analysis-II****Time : 3 Hours****Maximum Marks : 120****Min. Passing Marks: 42****Instructions to Candidates:**

Attempt all Ten questions from Part A, five question out of Seven from Part B and Four questions out of five 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 the Castiglino's Theorem.
2. Write down the assumptions of portal methods of analysis of frames under lateral loads.
3. Write Muller-Breslau Principle.
4. State the two reasons for unsymmetrical bending.
5. Define shear centre.
6. Write the application of influence line diagram.
7. What will be the strain energy due to axial force?
8. Differentiate two hinged arch and three hinged arch.
9. What do you mean by lack of fit in redundant frame?
10. Sketch the influence line diagram for bending moment at fixed end of a cantilever beam.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×8=40)

1. Derive the generalized expression to find out bending stress ' f_b ' at any point $P(x,y)$ due to application of bending moment ' M ' inclined at an angle θ with the principal plane of the section creating unsymmetrical bending.
2. Using Castigliano's theorem, calculate the central deflection of a simply supported beam carrying a concentrated load W at mid span.
3. Derive the expression for strain energy due to bending moment.
4. Make neat diagram of the influence lines for B.M. at a section 3m from one end of a simply supported beam, 12 m 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.
5. Draw the influence line diagram of propped support of a propped cantilever beam by using Muller-Breslau principle.
6. 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.
7. Prove that maximum bending moment at a section occurs when the section divides the uniformly distribution load in the same ratio as it divides the span when udl shorter than span is rolling on a beam.

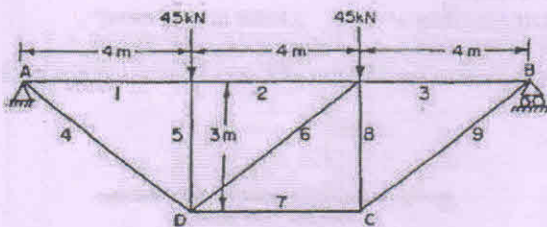
PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

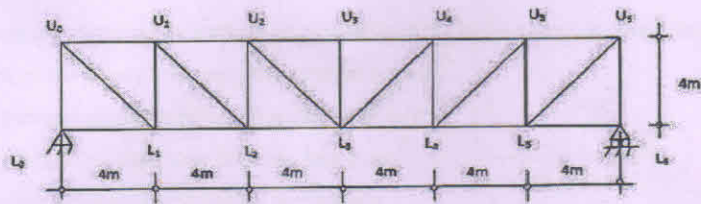
Attempt any Four questions.

(4×15=60)

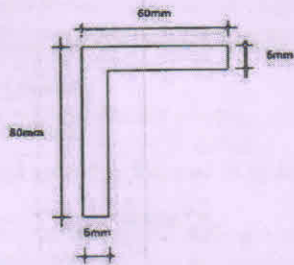
1. The steel truss shown below is anchored at A and supported on rollers at B. If the truss is so designed that under the given loading, all tension members are stressed to 100 N/mm^2 and all the compression members to 80 N/mm^2 , find the vertical deflection of the point C. Take $E=2 \times 10^5 \text{ N/mm}^2$.



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. A pair of shear leg has length of each leg as 5m and the distance between their feet is 4m. The line joining the feet of the legs is 7m from the foot of the guy rope. If the length of the guy rope is 10m, find the thrust in each leg and the pull in the guy rope when a load of 100kN is suspended from the head.
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,

