6E7121

Total No. of Questions : 22 Total No. of Pages : 04

Roll No. : .....

6E7121

B.Tech. VI-Sem. (Main/Back) Exam., May-2025

CIVIL 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 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)

1. IS-875 Part 1 & 2
2. IS-875 Part 3 : 2002, 2015
3. IS-1893 Part 1 : 2016

PART-A [10x2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. Difference between Load bearing structure and framed structure.

Q.2. Write down various loads that may act on a building or structure.

Q.3. Write down the formula for calculating wind pressure.

PART-C [3x10=30]

(Descriptive/Analytical/Problem-Solving/Design Question)

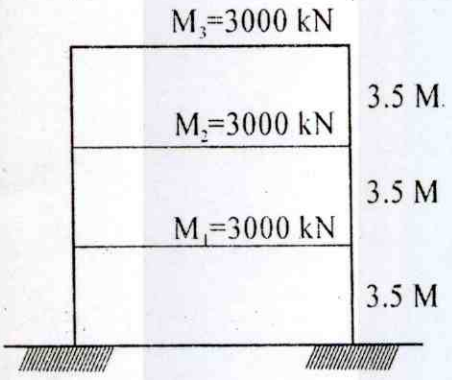
Attempt any three questions

Q1. Calculate wind pressure on a farm house building.

Take the following data :

Plan dimension 18m × 10m and height 3.5m, Roof angle is 5° (degree). Overhang of building on either downward side 0.5m. Opening in the building is 10% of wall area. The building is situated in Delhi city. Calculate wind pressure and design forces on all wall.

Q.2 A 3 storey RC frame building is shown in fig. below is situated at Delhi. The height between the floor is 3.5m and height of building is 10.5m. The soil below the foundation is medium hard soil. Assume building is intended to be used as an hospital building. Determine the total base shear as per IS 1893 (Part-I) : 2016 and distribute the base shear along the height of buildings.



Q.3 Explain the ductile detailing in column and beam connections.

Q.4 Explain salient features of IS code 13920 and write key provisions with clauses.

Q. 5 What are the various lateral and vertical load resisting systems used in buildings?

6E7122

Total No. of Questions : 22 Total No. of Pages : 08

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6E7122

B.Tech. VI-Sem. (Main/Back) Exam., May-2025

CIVIL 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 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)

1. ..... 2. .....

PART-A **[10×2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q. 1. What are the primary assumptions made in the Unit Load Method for deflection analysis?

Q. 2. Define redundant frame and give examples.

Q. 3. State Castigliano's First Theorem.

Q. 4. State the relationship between strain energy and internal forces for bending in beams.

Q. 5. Define the concept of virtual work in energy methods.

Q. 6. Write short note on Muller Breslau principle?

Q. 7. A live load of 20 kN moves on a girder of span 20 m. Calculate the maximum negative shear force at a distance of 8 m from point A.

Q. 8. Define Principle of centroidal axis of inertia.

Q. 9. Define the Shear Centre.

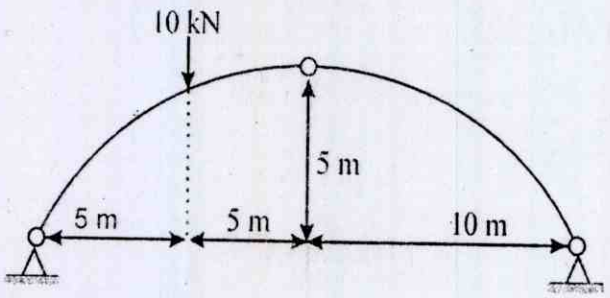
Q. 10. Define Unsymmetrical bending.

PART-B **[5×4=20]**

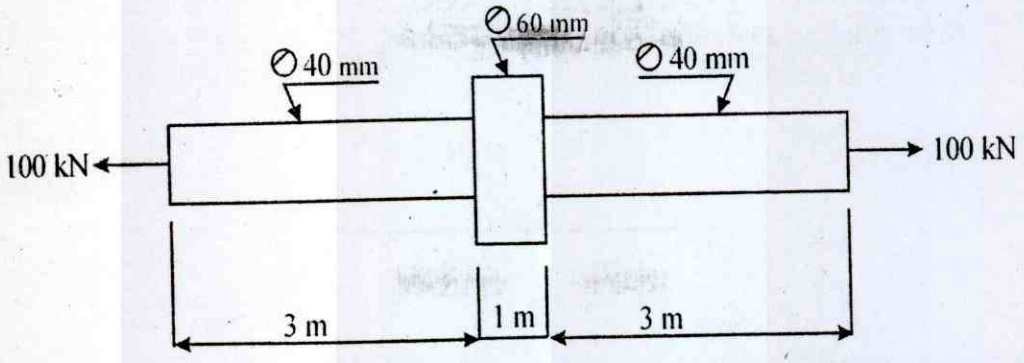
(Analytical/Problem solving questions)

Attempt any five questions

Q. 1. A three hinged parabolic arch having a span of 20 m and a rise of 5 m carries a point load of 10 kN at quarter span from the left end as shown in the figure. The resultant reaction at the left support and its inclination with the horizontal are respectively.

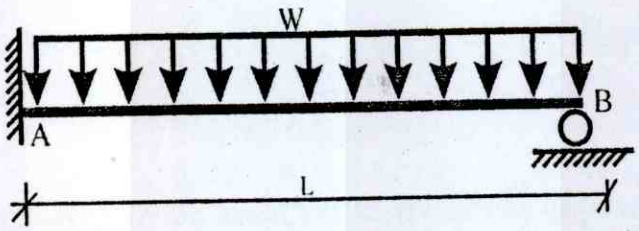


Q. 2. The bar shown in Figure is 40 mm in diameter for a length of 3 m, 60 mm in diameter for a length of 1 m and 40 mm in diameter for the remaining 3 m of its length. An axial load of 100 kN is gradually applied. Find the total strain energy produced in the bar and compare this value with that obtained in a uniform bar of the same length and having the same volume under the same load. Take $E=2 \times 105$ N/mm^2.

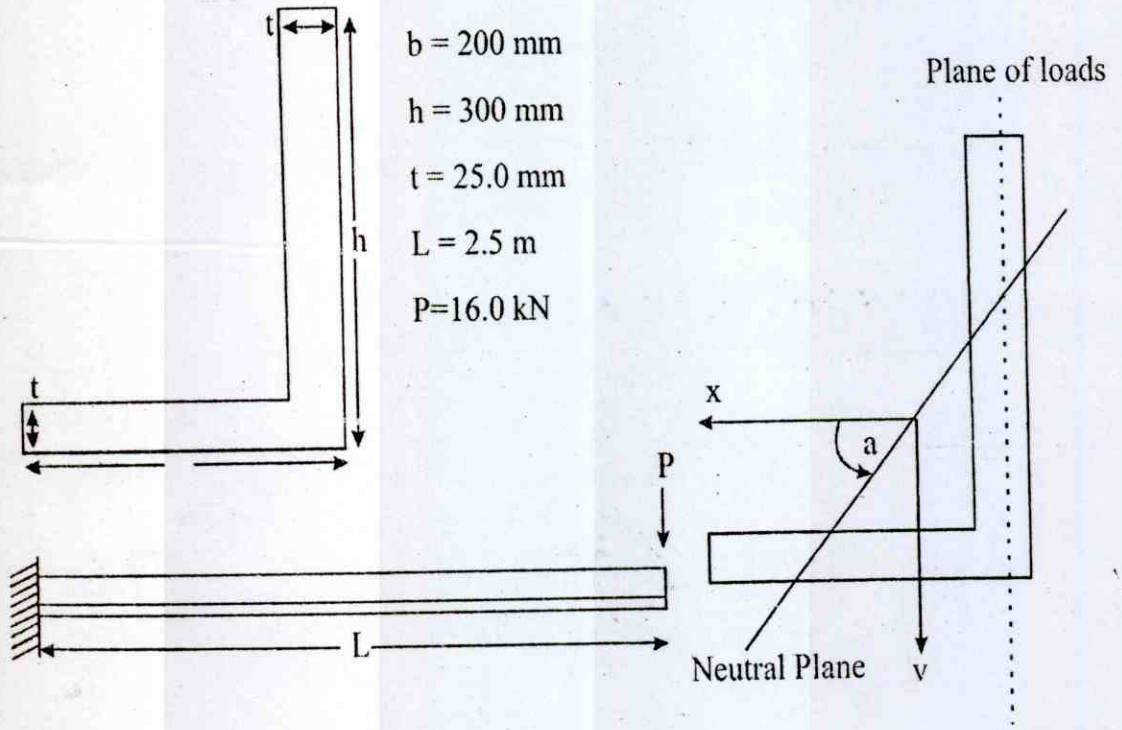


Q. 3. Describe the general steps involved in using the Unit Load Method to calculate deflection in frames.

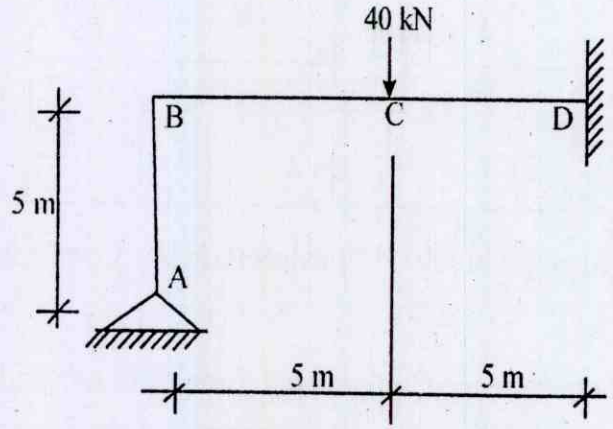
Q. 4. Determine the reactions by using Castigliano's second theorem and draw the shearing force and bending moment diagrams for the beam show in Fig. EI constant.



Q. 5. Unsymmetric beam bending : Find the neutral axis direction, and calculate that the maximum stresses in the beam.



Q. 6. Determine the reactions for the frame shown in Fig. by using Castigliano's second theorem. EI constant.



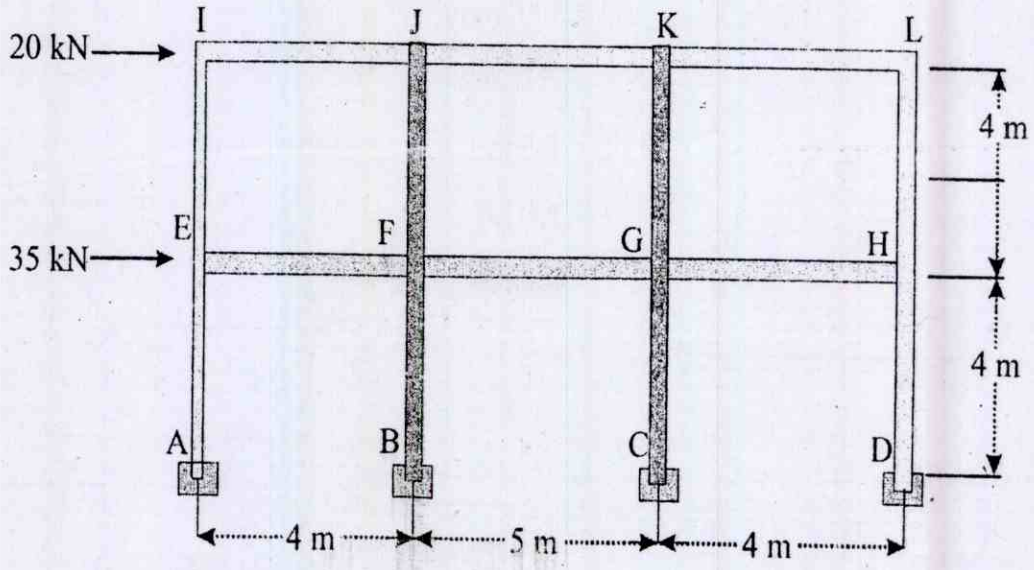
Q. 7. Outline the steps of the portal method used to analyze a structure.

PART-C **[3×10=30]**

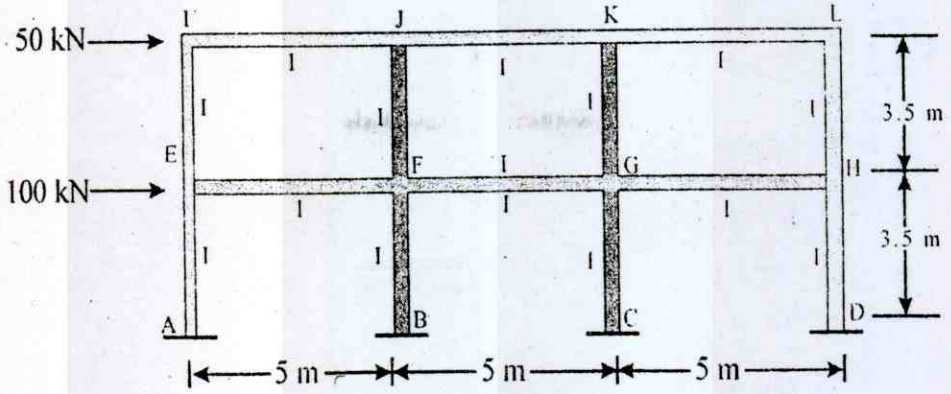
(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any three questions

Q. 1. List the assumptions made in the portal method. Analyze the building frame using portal method.



Q. 2. List the assumptions made in the Cantilever method. Analyze the building frame using portal method.

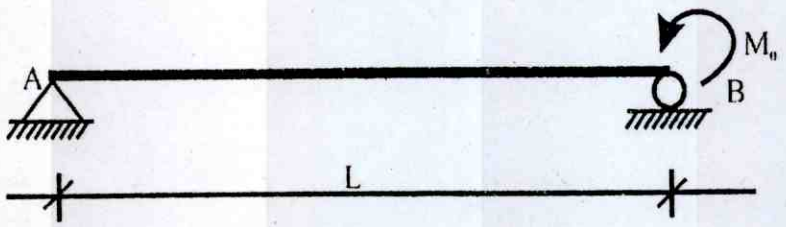


E = constant

Q. 3. Five point loads of 8 kN, 12 kN, 12 kN, 10 kN, and 20 kN are placed 5m apart and roll over a simply supported girder of span 90 m. The loads are moving from left to right, with a 20 kN load leading. Determine the position of this load system for the absolute maximum bending moment that may occur anywhere in the girder. Also, calculate the value of the maximum bending moment and the maximum bending moment at a distance of 32 m from point A.

Q. 4. A two hinged symmetrical parabolic arch of span 30 m and central rise 6 m carries a point load of 40 kN at a distance of 5 m from the left support. Find the horizontal thrust at each support. Also find the maximum bending moment.

Q. 5. Determine the rotation at point A of the beam shown in Fig. Use the virtual work method. EI constant.



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6E7123

Total No. of Questions : 22 Total No. of Pages : 04

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6E7123

B.Tech. VI-Sem. (Main/Back) Exam. - 2025

Civil 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)

1. ..... 2. .....

PART-A **[10×2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. What is meant by ℓpcd?

Q.2. Differentiate between Coagulation and Flocculation.

Q.3. What is Hardy-Cross method?

Q.4. Compare Grease Trap and Grit Chamber.

Q.5. Define BOD and COD.

Q.6. What is Sewage Farming?

Q.7. Differentiate between Sewage and Sullage.

Q.8. Give two examples each of aerobic and anaerobic treatment systems.

Q.9. Mention important air quality standards as per CPCB.

Q.10. Define Oxygen sag curve.

PART-B [5x4=20]

(Analytical/Problem-solving questions)

Attempt any five questions

Q.1. Compare the different sources of water for selecting them as a source of water supply project.

Q.2. What is Fire Demand? How will you calculate fire demand? Explain the methods/ formula.

Q.3. What do you understand by the term "Design Period"? Discuss the design period of various water supply and sewage components.

Q.4. Distinguish between discrete particle settling and flocculent settling. Draw neat sketch also.

Q.5. Determine ultimate first stage BOD for a wastewater having 5-day BOD at 20°C as 150 mg/l. Assume deoxygenation constant at 20°C as 0.2 per day.

Q.6. Discuss the merits and demerits of separate and combined system of sewage.

Q.7. Explain the classification and composition of air pollutants. Also discuss the control measures for air pollution.

PART-C [3x10=30]

(Descriptive/Analytical/Problem-Solving/Design questions)

Attempt any three questions

Q.1. Explain the construction, working and backwashing of a rapid sand filter with the help of a neat sketch. Compare the slow and rapid sand filters.

Q.2. Design a continuous flow rectangular sedimentation tank for a population of 20,000 persons with an average per capita demand of 120 litres per day. Assume detention period of 6 hours and other data suitably, if any.

Q.3. A discharge of 700 ℓps is flowing in a circular sewer which is running half full. Determine the size of sewer, assuming $i = 0.0001$ and $n = 0.015$.

Q.4. The population statistics pertaining to a town are given below. Calculate the population expected in the year 2020 using geometrical and incremental increase methods.

Year	1970	1980	1990	2000	2010
Population	70,000	1,00,000	1,50,000	2,10,000	2,50,000

Q.5. Explain various types of chlorination in water treatment.

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6E7124

Total No. of Questions : 22 Total No. of Pages : 04

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6E7124

B.Tech. VI-Sem. (Main/Back) Exam., May–2025

CIVIL ENGINEERING

6CE4-04 Design of Steel Structures

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)

1. ..... 2. .....

PART-A **[2x10=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. What is Rolled steel sections?

Q.2 Explain the relation between load factor and shape factor.

Q.3. What is Plastic Hinge?

Q.4. Name the type of failure of bolted joints, any two.

Q.5. Name any four elements of plate girder.

Q.6. What is the drag load in gantry and crane truss arrangement?

Q.7. Explain the wed crippling in beam.

Q.8. What is outstand of web stiffcher?

Q.9. Describe pre engineered buildings.

Q.10. Why the portal bracing are provided in truss girder bridge?

PART-B **[5x4=20]**

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Find the shape factor of hollow tube section of external diameter D and internal diameter d.

Q.2 Explain Stiff bearing length and Buckling resistance of stiffeners in plate girder.

Q.3. What is Shear lag? Under what circumstances will block shear failure dominate?

Q.4. Why are plastic or compact sections preferred for compression members? Why a separate provision (formula) for the design of a single angle strut has been proposed by IS : 800 Code?

Q.5. How does buckling of column and beam differ? Draw a neat diagram of Bolted gusset base.

Q.6. Explain with neat diagram, the typical arrangement of Gantry girder and crane truss system.

Q.7. What are the applications of pre-engineered buildings? Discuss the design aspects of foot over bridges.

PART-C **[3x10=30]**

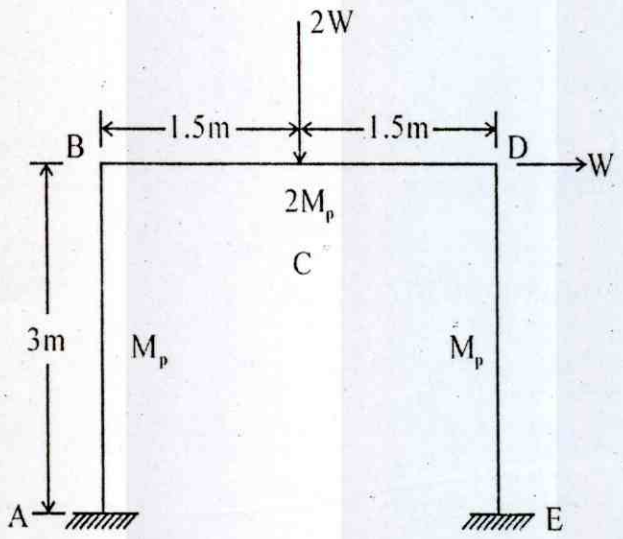
(Descriptive/Analytical/Problem-Solving/Design questions)

Attempt any three questions

Q.1. Design a bridge truss diagonal subjected to a factored tensile load of 300 kN. The length of the diagonal is 3.0 m. The tension member is connected to a gusset plate 16mm thick with one line of 20 mm diameter bolts of grade 8.8.

Q.2. Design a stanchion 3.5 m long in a building, subjected to a factored load of 550 kN. Both the ends of stanchion are effectively restrained in direction and position. Use steel of grade Fe 410.

Q.3. Find out the collapse load for the portal frame as shown in figure :



Q.4. A Gantry girder with manually operated travelling crane, to be used in an industrial building, for the following data :

Crane capacity	–	200kN
Self-weight of the crane girder excluding trolley	–	200kN

Self-weight of the trolley, electric motor, hook, etc. – 40kN

Approximate Minimum approach of the crane hook to the Gantry girder –1.20 m

C/C distance b/w columns (span of the gantry girder) – 7m

C/C distance b/w gantry rails – 15m

Diameter of crane wheels : – 150mm

Self-weight of the rail section – 300N/m

Wheel base – 3.5m

Grade of Steel Fe 415

Find the suitable trial sections of gantry girder.

Q.5. Write short notes on **any two** of the following :

(a) Minimum web thickness as per serviceability and compression flange buckling criterion

(b) Design procedure of plate girder

(c) Characteristics of pre-engineered building

(d) Lacing and Batten in compression member

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6E7125

Total No. of Questions : 22 Total No. of Pages : 04

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6E7125

B.Tech. VI-Sem. (Main/Back) Exam., May–2025

CIVIL ENGINEERING

6CE4-05 / Estimating and 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)

1. Nil

2. Nil

PART-A **[10×2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. List the types of estimate.

Q.2. Differentiate between revised and supplementary estimate.

Q.3. Define Lead and Lift.

Q.4. What is Overhead Cost?

Q.5. What is Work-Charged establishment?

Q.6. Define Scrap Value.

Q.7. What is the purpose of sinking fund?

Q.8. What is Outgoings?

Q.9. Define Depreciation.

Q.10. What is BSR?

PART-B

[5x4=20]

(Analytical/Problem-solving questions)

Attempt any five questions

Q.1. Prepare the analysis of rate for lime concrete in foundation with 40mm brick ballast per cu.m. Assume the required data suitably.

Q.2. Describe the principles of estimating.

Q.3. What are the different methods of preparing approximate estimate? Write the suitability of each method and also an example of each one.

Q.4. Explain the factors which affect the rate analysis.

Q.5. Why valuation of properties is required? Discuss the different methods of valuation.

Q.6. Explain the centre-line and long wall, short-wall methods of preparing estimate and compare them based on their merits and demerits.

Q.7. A building is let out @ ₹ 8,000/- per month. The total outgoings of the property are estimated to be 12% of the gross income. Calculate the capitalized value of the property if present rate of interest is 6% and life is 50 years.

PART-C [3x10=30]

(Descriptive/Analytical/Problem-Solving/Design questions)

Attempt any three questions

Q.1. What is the purpose of importance of estimate? Explain various types of estimates and their significance.

Q.2. Prepare a preliminary estimate of a building having carpet area 500 m^2. An area of 30% of the built-up area occupied by circulation elements and 10% of the built up area is occupied by walls. The plinth area rate for civil work is ₹ 10,000/- per m^2. The cost of water supply sanitary and electrification is 15% of civil cost, whereas the cost of other services is 10% of civil cost. Assume contingency and departmental charge as 8%.

Q.3. Explain the methods of finding out depreciation.

Q.4. Calculate the quantity of earthwork for a bank of canal from the following data, using Prismoidal formula.

Top width = 2m, RL of top of the bank = 103.00

Side slope 2 :1 for one side and 2½ :1 for other side

Chainage	50	60	70	80	90
GL	101.50	101.00	99.00	98.00	96.50

Q.5. Explain the following terms :

(i) Year's purchase

(ii) Measurement Book

(iii) Capitalized value

(iv) Contingency Charges

(v) Plinth area

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6E7127

Total No. of Questions : 22 Total No. of Pages : 04

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6E7127

B.Tech. VI-Sem. (Main/Back) Exam. - 2025

CIVIL ENGINEERING

6CE5-12 / Solid and Hazardous Waste Management (El.-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)

1. Nil 2. Nil

PART-A [10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. Differentiate between solid waste and hazardous waste.

Q.2. List the types of municipal solid waste.

Q.3. What is 3R principle?

Q.4. Define composting.

Q.5. What is incineration?

Q.6. What is e-waste? Give some examples.

Q.7. What is the role of transfer station in MSWM?

Q.8. Define the term "Waste to Energy".

Q.9. Name various components of waste collection system.

Q.10. Write composition of municipal solid waste.

PART-B

[5×4=20]

(Analytical/Problem-solving questions)

Attempt any five questions

Q.1. Explain the factors influencing solid waste generation.

Q.2. Discuss the adverse health and environmental impacts due to improper handling of municipal solid waste.

Q.3. Explain about the collection and storage of waste.

Q.4. Distinguish between prevention and waste reduction with some suitable examples.

Q.5. Explain physical, chemical and biological characteristics of municipal solid waste.

Q.6. What is Haul distance? Explain briefly the Hauled Container Systems (HCSs) for collection of solid wastes.

Q.7. Describe the various techniques of waste processing.

PART-C [3×10=30]

(Descriptive/Analytical/Problem-Solving/Design questions)

Attempt any three questions

Q.1. Describe the design and operation of sanitary landfill with a neat sketch diagram.

Q.2. Explain in detail the concept of waste segregation at source and its significance in MSWM.

Q.3. Discuss in detail the latest rules related to SWM, hazardous wastes and plastic wastes.

Q.4. Explain the various options/methods for treatment and disposal of solid wastes and their relative merits.

Q.5. Discuss the role of public and NGOs in effective solid waste management.

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6E7131

Total No. of Questions : 22 Total No. of Pages : 04

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6E7131

B.Tech. VI-Sem. (Main/Back) Exam., May–2025

CIVIL ENGINEERING

6CE5-16 / Geographic Information System and Remote Sensing (El.-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)

1. ..... 2. .....

PART-A **[10×2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q. 1. What is basic principle of remote sensing?

Q. 2. What is visible spectrum?

Q. 3. What do you understand by Multi Concept in Remote Sensing?

Q. 4. How does image resolution affect interpretation accuracy?

Q. 5. What is LiDAR?

Q. 6. Write any two limitations of remote sensing techniques.

Q. 7. What are the key principles of interpreting areal and satellite images?

Q. 8. How does GIS contribute to map revision?

Q. 9. What are the different land use applications of remote sensing?

Q. 10. What do you understand by the scale of arial photograph?

PART-B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q. 1. Describe the components of a remote sensing system and their roles in acquiring, processing, and analyzing remote sensing data. How do these components work together to produce useful information for various applications?

Q. 2. How do oblique and vertical aerial photographs differ in terms of acquisition, applications and their effectiveness in photogrammetric analysis? Discuss the advantages and disadvantages of each, and provide examples of situations where one type would be more suitable than the other.

Q. 3. A line AB, 2000 m long laying at a elevation of 500 m measures 8.65 cm on a vertical photograph for which focal length is 20 cm. Determine the scale of the photograph in an area the average elevation of which is about 700 m.

Q. 4. Give the details of vector data structure and mention its merits and demerits in comparison with raster data.

Q. 5. Explain the concept of feature extraction in digital image processing.

Q. 6. What are the various categories on Non-Imaging Sensors employed in Remote Sensing and how do they function?

Q. 7. What are the various applications of GIS in municipal? Explain in detail.

PART-C **[3×10=30]**

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q. 1. Explain the function and use of stereoscopes in photogrammetry. If the parallax difference between the top and bottom of a tree is 1.32 mm on a stereo pair photo taken at 3000 m above ground level. And the average photo-base is 66 mm. Calculate the height of the tree.

Q. 2. Explain the concept of sun-synchronous orbits in remote sensing. What advantages do sun-synchronous orbits offers for earth observation missions, and how do they contribute to consistent illumination conditions for imaging?

Q. 3. Compare the characteristics of passive and active sensors used in remote sensing. Provide examples of each sensor type and discuss their advantages and limitations in various remote sensing applications.

Q. 4. What are image interpretation elements? Explain supervised classification. Discuss the process for carrying out visual interpretation.

Q. 5. What are the different types of platforms in remote sensing. Also, explain Whisk-broom scanning and Push-broom scanning concept in detail with suitable diagram.

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6E1542

Total No. of Questions : 22 Total No. of Pages : 04

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6E1542

B.Tech. VI-Sem. (Back) Exam. - 2025

CIVIL ENGINEERING

6CE4-02 Structural Analysis

Time : 3 Hours **Maximum Marks : 120**

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)

1. ..... 2. .....

PART-A [10x2=20]

(Answer should be given up to 25 words only)

All questions are compulsory.

Q.1. What are the various approximate methods used for lateral loads?

Q.2. What does Unsymmetrical Bending mean?

Q.3. What does influence line diagram mean?

Q.4. Write what is Castigliano's theorem.

Q.5. Explain the behaviour of stresses due to change in temperature.

Q.6. Define the term 'girder moment factor' from factor method.

Q.7. Define Horizontal Thrust.

Q.8. Write assumptions involved in Portal method.

Q.9. Explain shear centre.

Q.10. What do you understand by Strain energy?

PART-B [5x8=40]

(Analytical/Problem-solving questions)

Attempt any five questions.

Q.1. Prove that for a three-hinged parabolic arch of span 'L' and central rise 'r' the equation for parabolic arch is given by.

$y = 4rx\,(L - x)/L^2$

Where, x and y are the coordinates of any point in the arch.

Q.2 A space frame a shown below in **Figure 1** is supported at A, B, C and D in a horizontal plane, through ball joints. The member EF is horizontal and is at a height of 3m above the base. The loads at the joints E and F shown in the figure acts in horizontal plane. Find out the coordinates of all the points and write equations for all the points and write equations for joint F in terms of tension coefficients. (No need to solve)

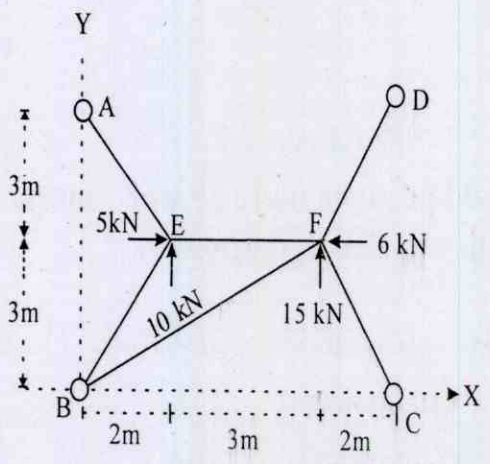

Figure-1

Q.3. Explain Muller Breslau principle.

A point load of 30 kN rolls over a girder of 20m span. Draw ILD and find the maximum positive and negative shear force and bending moment at a point 6m from the left hand end.

Q.4. Using Castigliano's first theorem, determine the rotation of the overhanging end A of the beam loaded as shown in Figure 2.

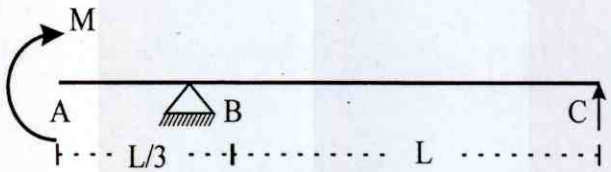

Figure-2

Q 5. Explain the following terms :

(a) Principal Centroidal axis

(b) Graphical method for locating principal axes

Q.6. A three hinge parabolic Arch of 25m span and 4m central rise carries a point load of 10KN at 4m horizontally from the left hand hinge. Calculate only the maximum Bending moment (negative only).

Q.7. Derive the maximum shear force value at a section subjected to single concentrated load 'P' rolling along a simply supported beam. Also find absolute maximum negative shear force at any section.

PART-C [4x15=60]

(Descriptive/Analytical/Problem-solving/Design question)

Attempt any four questions.

Q1. A parabolic Arch hinged at the ends has a span 30m and rise 5m. A concentrated load of 12kN acts at 10m from the left hinge. The second moment of area varies as the secant of the slope of the rib axis. Calculate the horizontal thrust and the reactions at the hinges. Also calculate the maximum bending moment anywhere on the arch.

Q.2. Analyse the building frame subjected to horizontal forcs, as shown in Figure 3 . Use portal method.

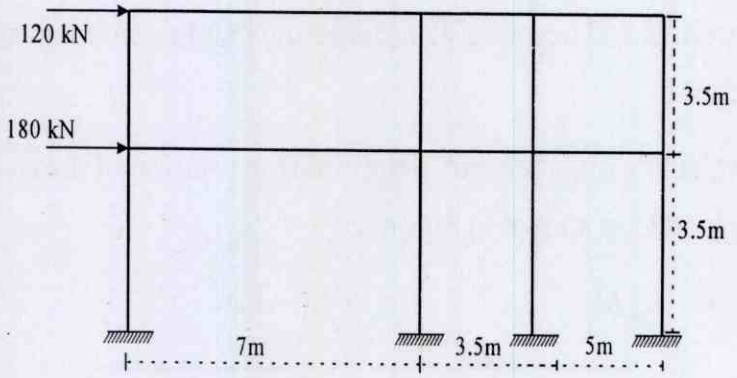

Figure-3

Q.3. A beam of rectangular section, 80 mm wide and 120mm deep is subjected to a bending moment of 12kN-m. The trace of the plane of loading is inclined at 45° to the Y - Y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress included in the section.

Q.4. A beam ABC is supported at A, B and C and has a hinge at D distant 3m from A. AB=7m and BC = 10m. Draw the influence lines for reactions at A, B and C, if a UDL of intensity 2kN/m and length 3m, Travels from left to right.

Q.5. Using Castigliano's theorem of minimum strain energy, analyse the frame shown in Figure - 4, EI is constant for the whole frame.

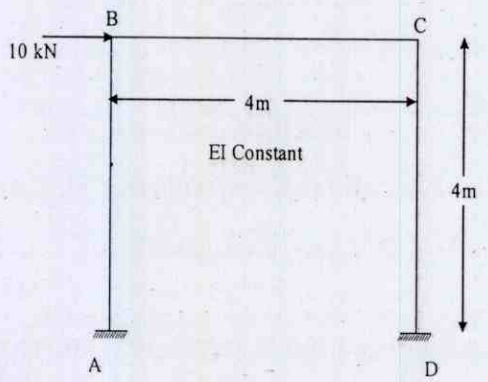

Figure-4

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6E1544

Total No. of Questions : 22 Total No. of Pages : 04

Roll No. : .....

6E1544

B.Tech. VI-Sem. (Back) Exam. - 2025

CIVIL ENGINEERING

6CE4-04 / Design of Steel Structures

Time : 3 Hours **Maximum Marks : 120**

Instruction 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)

1. _____ 2. _____

PART-A **[10x2=20]**

Answer should be given up to 25 words only. All questions are compulsory.

Each question carries 02 marks.

Q.1. Name any two theorems of Plastic analysis.

Q.2. What is Prying Force ?

Q.3. Name any four types of Tension members.

Q.4. What is Stiff Bearing length in a Plate Girder ?

Q.5. Name any four components of Gantry and Crane Truss arrangement.

Q.6. Discuss two applications of Pre-Engineered buildings.

Q.7. Explain Web crippling.

Q.8. In what sense Column caps are similar to Column base plates ?

Q.9. What is the importance of Purlin in Roof truss ?

Q.10. What is Hot Rolled Steel ?

PART-B **[5x8=40]**

Analytical / Problem solving questions. Attempt any five questions.

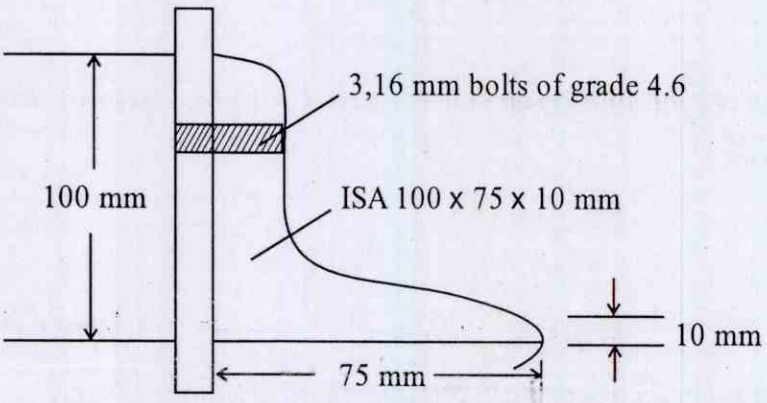
Each question carries 10 marks.

Q.1. Find the shape factor of a Triangular section.

Q.2. What is Shear Lag ? Explain the types of failures in Tension member.

Q.3. Differentiate between M.O.T. and E.O.T. related to Gantry Girder System. Draw a neat diagram to explain typical arrangement of Gantry girder and Crane girder system.

Q.4. Determine the effective net area for the section shown in figure. The steel is of grade Fe410.



Q.5. Differentiate between Lacing and Battens with neat diagrams.

Q.6. The plate of a 6 mm thick tank are connected by a single bolted lap joint with 20 mm diameter bolts at 60 mm pitch. Calculate the efficiency of the joint. Take fu of plate as Fe410 Mpa and assume 4.6 grade bolts.

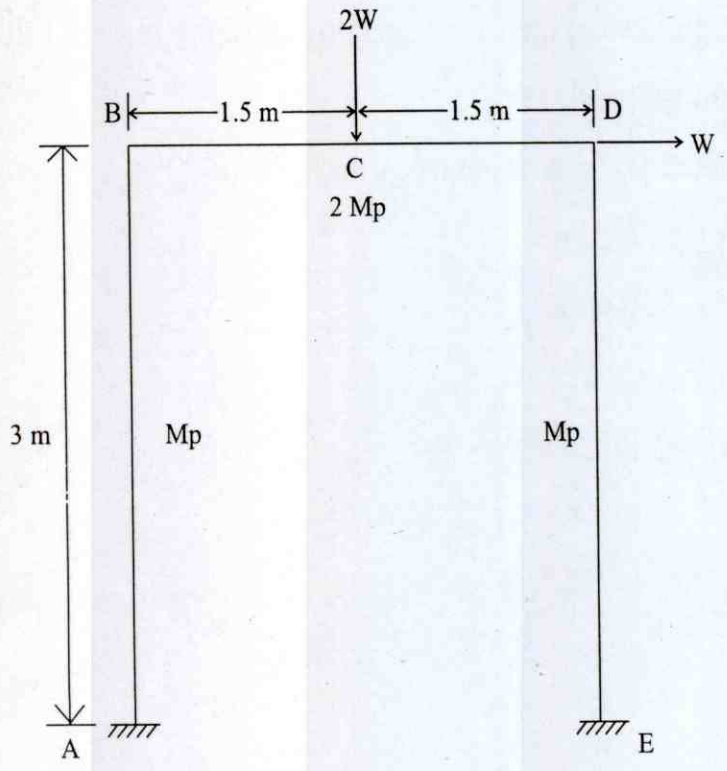
Q.7. How does Buckling of Column and Beam differ ? Why should Plastic or Compact section be preferred for Flexural members in Limit State Design method ?

PART-B [4x15=60]

Descriptive / Analytical / Problem solving / Design questions.

Attempt any four questions. Each question carries 15 marks.

Q.1. Compute the Collapse load for the Portal frame as shown in figure :



Q.2. Design a Bridge truss diagonal subjected to a factored tensile load of 300 kN. The length of the diagonal is 3.0 m. The tension member is connected to a Gusset plate 16 mm thick with one line of 20 mm diameter bolts of grade 8.8.

Q.3. Design a Stanchion 3.5 m long, in a building, subjected to a factored load of 550 kN. Both the ends of the Stanchion are effectively restrained in direction and position. Use Steel of grade Fe 410.

Q.4. What do you understand by outstand of Web Stiffeners ? How does a Plate Girder derive Post Buckling strength ? Write the design procedure of a Plate girder.

Q.5. Design a Gantry girder to be used in an Industrial building carrying a Hand operated overhead travelling Crane, for the following data :

Crane capacity : 200 kN

Self weight of the Trolley, Hook, Motor etc. : 40 kN

Self weight of Crane girder excluding trolly : 200 kN

Wheel base : 3.5 m

Approximate minimum approach of the Crane hook to the Gantry girder : 1.20 m

C/C distance between Gantry Rails : 15 m

C/C distance between Columns (Span of gantry girder) : 7.5 m

Self weight of Rail section : 300 N/m

Diameter of Crane wheels : 150 mm

Grade of Steel Fe 415

Find the suitable trial sections for gantry girder.

xxx