GUJARAT TECHNOLOGICAL UNIVERSITY

DI -5 SEMESTER – OLD PAPER – W23 TO S25 – QUESTION BANK(English)

Subject Name & Code:

Advance Analysis of Structures- 4350609

Unit I - Fundamentals

Repeated Questions:

1. **Differentiate between determinate and indeterminate structures giving an example of each.**
   - Appeared in: W23 (Q1a, 03 marks), S24 (Q1a, 03 marks)
2. **Define skeletal structures. Give types of skeletal structures.**
   - Appeared in: S24 (Q1b, 04 marks), W23 (Q1b, 04 marks)
3. **Enlist popular structural analysis software.**
   - Appeared in: W23 (Q3a-OR, 03 marks), S25 (Q1a, 03 marks)

Other Important Questions:

1. Explain in brief determinate and indeterminate structures giving an example of each. (S24 - Q1a, 03 marks)
2. What is skeletal structures? Give types of skeletal structures. (S24 - Q1b, 04 marks)
3. Define dead load, live load & static load. (W24 - Q1a, 03 marks)
4. Give static indeterminacy and kinetic indeterminacy for continuous beam shown in Fig.1. Calculate fixed end moments, stiffness factors and distribution factors of beam. (W23 - Q1c, 07 marks)
5. Give static indeterminacy and kinetic indeterminacy for portal frame shown in Fig.2. Calculate fixed end moments, stiffness factor and distribution factors of frame. (W23 - Q1c-OR, 07 marks)
6. Solve truss determinate or indeterminate? as shown in figure 1. (W24 - Q2a, 04 marks)
7. Differentiate between statically determinate beam & statically indeterminate beam. (W24 - Q2c, 07 marks)
8. Differentiate between flexibility method & stiffness method in analysis of beam. (W24 - Q2d, 07 marks)
9. Differentiate between flexibility method and Stiffness method. (S25 - Q1b, 03 marks)
10. Differentiate between statically determinate beam & statically indeterminate beam. (S25 - Q1c, 03 marks)
11. Define skeletal and continuum structures. Also enlist various skeletal and continuum structures. (S25 - Q1d, 04 marks)

Unit II - Fixed Beams

Repeated Questions:

1. **A fixed beam of [X] m span carries a central point load of [Y] kN. Find fixed end moments. Draw shear force and bending moment diagram.**
   - Appeared in: S24 (Q2b, 04 marks), S25 (Q2b, 04 marks)
2. **A fixed beam of [X] m span is subjected to a UDL of [Y] kN/m over the entire span. Find fixed end moments. Draw shear force and bending moment diagram.**
   - Appeared in: W23 (Q2b-OR, 04 marks), S25 (Q2d, 04 marks)
3. **List out advantages/disadvantages of a fixed beam.**
   - Appeared in: W24 (Q3a, 03 marks), W24 (Q3a-OR, 03 marks), W23 (Q2a, 03 marks)

Other Important Questions:

1. Differentiate between fixed beam and simply supported beam. (W24 - Q3b, 04 marks)
2. A fixed beam 8m span is subjected to an UDL of 30kN/m over entire span as shown in figure 3. Compute fixed end moments. Draw shear force and bending moment diagram of beam. (W24 - Q3c, 07 marks)
3. A fixed beam 8m span is subjected to a central point load of 60kN as shown in figure 4. Compute fixed end moments. Draw shear force and bending moment diagram of beam. (W24 - Q3c-OR, 07 marks)
4. Describe importance of point of contra flexure. (W24 - Q3b-OR, 04 marks)
5. A fixed beam of 6 m span carries UDL of 45 kN/m over entire span along with central point load of 75 kN. Find fixed end moments of beam. Draw shear force and bending moment diagram of beam. Locate point of contraflexure in beam if any. (W23 - Q2c, 07 marks)
6. A fixed beam is as shown in Fig-3. Find fixed end moments. Draw shear force diagram and bending moment diagram. (W23 - Q2c-OR, 07 marks)
7. Explain μ and μ' diagram with suitable example. (W23 - Q2a-OR, 03 marks)
8. A fixed beam of 4 m span carries UDL of 10kN/m over entire span along with central point load of 80 kN. Find fixed end moments of beam. Draw shear force and bending moment diagram of beam. (S25 - Q2c, 07 marks)
9. A fixed beam of 6 m span carries UDL of 40 kN/m over entire span along with central point load of 80 kN. Find fixed end moments of beam. Draw shear force and bending moment diagram of beam. (S25 - Q2c-OR, 07 marks)

Unit III - Moment Distribution Method

Repeated Questions:

1. **Define stiffness factor. State formula for stiffness factor for a beam when (i) far end is fixed (ii) far end is hinged (iii) far end is continuous.**
   - Appeared in: S24 (Q3b, 04 marks), W23 (Q3b, 04 marks), S25 (Q3b-OR, 04 marks)
2. **Define distribution factor. Calculate distribution factor for a given continuous beam.**
   - Appeared in: S24 (Q3b-OR, 04 marks), W23 (Q3b-OR, 04 marks), S25 (Q3b, 04 marks)
3. **Draw bending moment diagram for a given continuous beam/frame using the Moment Distribution Method.**
   - Appeared in: S24 (Q1c, 07 marks), S24 (Q1c-OR, 07 marks), S24 (Q3c, 07 marks), W23 (Q3c, 07 marks), S25 (Q3c, 07 marks), S25 (Q3c-OR, 07 marks)

Other Important Questions:

1. Explain in brief stiffness and flexibility method. (S24 - Q3a, 03 marks)
2. A continuous beam is as shown in Fig.4. Draw bending moment diagram for given beam. Use Moment Distribution Method. (S24 - Q3c, 07 marks)
3. A continuous beam ABCD is simply supported at A, B, C and D. Span AB = 3 m, Span BC = 4 m and Span CD =3 m. It carries UDL of 30 kN/m on all three entire spans. Draw bending moment diagram for given beam. Use Moment Distribution Method. (S24 - Q3c-OR, 07 marks)
4. Explain various popular structural analysis software. (S24 - Q3a-OR, 03 marks)
5. Differentiate between static and dynamic analysis, its importance and usefulness. (W23 - Q3a, 03 marks)
6. A continuous beam is as shown in Fig.4. Draw bending moment diagram for given beam. Use Moment Distribution Method. (W23 - Q3c, 07 marks)
7. A continuous beam ABCD is simply supported at A, B, C and D. Span AB = 4m, Span BC = 6 m and Span CD =4 m. It carries UDL of 36 kN/m on all three entire spans. Draw bending moment diagram for given beam. Use Moment Distribution Method. (W23 - Q3c-OR, 07 marks)
8. Define Stiffness of a beam. State factors affecting Stiffness of beam. (S25 - Q3a, 03 marks)
9. Draw bending moment Diagram for given continuous beam as shown in Fig no:02 by Using Moment Distribution Method. (S25 - Q3c, 07 marks)
10. Explain the terms: (1) Fixed end Moments (2) Carry over factor (3) Carry over Moments (S25 - Q3a-OR, 03 marks)
11. Define Continuous Beam. State formula for stiffness factor for a Beam when (i) far end is fixed (ii) far end is hinged (iii) far end is continuous. (S25 - Q3b-OR, 04 marks)
12. Draw bending moment Diagram for given continuous beam as shown in Fig. no: 03 by Using Moment Distribution Method. (S25 - Q3c-OR, 07 marks)

Unit IV - Direct and Bending Stresses

Repeated Questions:

1. **Explain core or kernel of a section. Draw core for rectangular and circular sections.**
   - Appeared in: S24 (Q4a, 03 marks), W24 (Q5b, 04 marks), S25 (Q4a, 03 marks)
2. **A square/rectangular column of side [X] mm is subjected to a compressive load of [Y] kN at an eccentricity of [Z] mm. Find the maximum and minimum stress at the base.**
   - Appeared in: W24 (Q5c, 07 marks), S24 (Q4b, 04 marks), S25 (Q4b, 04 marks)
3. **State and explain stability conditions for a Retaining wall or Dam.**
   - Appeared in: W24 (Q5b-OR, 04 marks), S24 (Q4b-OR, 04 marks), S25 (Q4a-OR, 03 marks)

Other Important Questions:

1. Define axial load, eccentric load, and eccentricity. (W24 - Q5a, 03 marks)
2. A square column of 400mm side carries a compressive load of 400kN at an eccentricity of 100mm on x-x axis. Find maximum stress and minimum stress at the base of column. (W24 - Q5c, 07 marks)
3. Define flexural rigidity with formula & unit. (W24 - Q5a-OR, 03 marks)
4. A trapezoidal masonry retaining wall of height 6m retains earth up to top on its vertical face. The top width of wall is 1m and bottom width is 3m. Find maximum and minimum stresses induced at the base of the wall. Take earth pressure 95.90kN and weight of masonry wall is 264kN. (W24 - Q5c-OR, 07 marks)
5. A column of 300 mm diameter is subjected by an eccentric load of 1000 kN at an eccentricity of 60 mm. Find the maximum and minimum stress in section. (S24 - Q4b, 04 marks)
6. A rectangular column section 400 mm x 800 mm is subjected to an eccentric compressive load of 800 kN at one of its corners. Find stresses induced at each corner and draw stress distribution diagram for section. (S24 - Q4c, 07 marks)
7. Explain preprocessor and postprocessor in structural analysis software. (S24 - Q4a-OR, 03 marks)
8. A masonry trapezoidal dam is 12 m high, 1.5 m wide at top and 4.5 m wide at bottom. Dam retains water up to 10 m height on its vertical face. Determine maximum and minimum resultant stresses at the base. Take density if masonry = 20 kN/m³ and density of water = 10 kN/m³. (S24 - Q4c-OR, 07 marks)
9. A Rectangular column of size 400 mm x 600 mm is subjected to a load of 800 kN on a axis bisecting 400 mm side at an eccentricity of 50 mm from center. Find maximum and minimum stresses in the section. (W23 - Q4a, 03 marks)
10. A rectangular column section 300 mm x 400 mm is subjected to an eccentric compressive load of 600 kN at one of its corners. Find stresses induced at each corner and draw stress distribution diagram for section. (W23 - Q4c, 07 marks)
11. Explain in brief various structural analysis methods and also provide suitability of method for computer programming. (W23 - Q4a-OR, 03 marks)

12. A masonry trapezoidal dam is 10 m high, 1.2 m wide at top and 4.8 m wide at bottom. Dam retains water up to 8 m height on its vertical face. Determine maximum and minimum resultant stresses at the base. Take density if masonry = 20 kN/m³ and density of water = 10 kN/m³. (W23 - Q4c-OR, 07 marks)

13. A masonry trapezoidal dam is 8 m high, 1.0 m wide at top and 4.0 m wide at bottom. Dam retains water up to 7.5 m height on its vertical face. Determine maximum and minimum resultant stresses at the base. Take density if masonry = 25 kN/m³ and density of water = 10 kN/m³. (S25 - Q4c, 07 marks)

14. A Rectangular column of size 200 mm x 300 mm is subjected to a load of 600 kN on a axis bisecting 200 mm side at an eccentricity of 60mm from center. Find maximum and minimum stresses in the section and draw stress distribution diagram. (S25 - Q4b-OR, 04 marks)

15. A masonry trapezoidal dam is 8 m high, 2 m wide at top and 6.0 m wide at bottom. Dam retains water up to 7.0 m height on its vertical face. Determine maximum and minimum resultant stresses at the base. Take density if masonry = 16 kN/m³ and density of water = 10 kN/m³. (S25 - Q4c-OR, 07 marks)

Unit V - Principal Planes and Principal Stresses

Repeated Questions:

1. **Explain principal planes and principal stresses.**
   - Appeared in: W24 (Q2a, 03 marks), S24 (Q5a, 03 marks), W23 (Q5a, 03 marks), S25 (Q5a, 03 marks)
2. **For a given state of stress at a point (with σx, σy, τxy), determine normal stress, tangential stress, and resultant stress on an inclined plane using the Analytical method.**
   - Appeared in: S24 (Q5b, 04 marks), W23 (Q5b, 04 marks), S25 (Q5b, 04 marks)
3. **For a given state of stress at a point (with σx, σy, τxy), determine principal stresses and principal planes using the Analytical method.**
   - Appeared in: S24 (Q5c, 07 marks), W23 (Q5c, 07 marks), S25 (Q5c, 07 marks)
4. **Solve the above problems (finding stresses on an inclined plane / principal stresses) using Mohr's circle (graphical) method.**
   - Appeared in: W24 (Q2c, 07 marks), S24 (Q5b-OR, 04 marks), S24 (Q5c-OR, 07 marks), W23 (Q5b-OR, 04 marks), W23 (Q5c-OR, 07 marks), S25 (Q5b-OR, 04 marks), S25 (Q5c-OR, 07 marks)

Other Important Questions:

1. Define principal plane and principal stress with figure. (W24 - Q2a, 03 marks)
2. Explain complimentary shear stress with figure. (W24 - Q2f, 04 marks)
3. The principal stresses on two mutually perpendicular planes are 80 N/mm² & 40 N/mm² both being tensile as shown in figure 2. Find normal stress, tangential stress and resultant stress on a plane inclined at 20º with major plane. (W24 - Q2g, 07 marks)
4. Give formula of normal stress on inclined plane & identify each term of formula. (W24 - Q2h, 03 marks)
5. Solve example Q 2 (C) by Mohr's circle (graphical) method. (W24 - Q2c, 07 marks)
6. In a strained material two direct stresses of 700 N/mm2 and 1200 N/mm2 both tensile are acting on certain point of two mutually perpendicular planes along with a shear stress of intensity 300 N/mm. Find Normal, tangential and resultant stress along a plane inclined at 30º with the axis of 1200 N/mm² stress. Also find maximum shear stress. Use analytical method. (S24 - Q5b, 04 marks)
7. A strained body is as shown in Fig.5. Determine principle stresses and principle planes by Analytical method. (S24 - Q5c, 07 marks)
8. State properties of Mohr's circle. (S24 - Q5a-OR, 03 marks)
9. Solve above problem Q.5 (b) by Mohr's circle (graphical) method. (S24 - Q5b-OR, 04 marks)
10. Solve above problem Q.5 (c) by Mohr's circle (graphical) method. (S24 - Q5c-OR, 07 marks)
11. At a point in a strained material, a tensile stress of 120 N/mm² & a compressive stress of 80 N/mm² are acting along two mutually perpendicular planes. Find normal stress, tangential stress and resultant stress along a plane inclined at 30º with the axis of 120 N/mm² stress. Also find maximum shear stress. Use analytical method. (W23 - Q5b, 04 marks)

12. A strained body is as shown in Fig.5. Determine principle stresses and principle planes by Analytical method. (W23 - Q5c, 07 marks)
13. State properties of Mohr's circle. (W23 - Q5a-OR, 03 marks)
14. Solve above problem Q.5 (b) by Mohr's circle (graphical) method. (W23 - Q5b-OR, 04 marks)
15. Solve above problem Q.5 (c) by Mohr's circle (graphical) method. (W23 - Q5c-OR, 07 marks)
16. A point in a strained material is subjected to two mutually perpendicular stresses 120 N/mm2 tensile and 80 N/mm2 compressive. Calculate analytically the normal, tangential and resultant stress on a plane inclined at 60° with the axis of major stress. Also calculate maximum shear stress. (S25 - Q5b, 04 marks)
17. A point in a strained material is subjected to two mutually perpendicular stresses 50 N/mm2 (tensile) and 30 N/mm2 (Compressive). It is also subjected to a shear stress 15 N/mm2. Find normal stress, tangential stress and resultant stress on a plane located at an angle 30° with minor stress. Also, locate Principal Planes and Principal stress.(Figure no-4) (S25 - Q5c, 07 marks)
18. State properties of Mohr's circle. (S25 - Q5a-OR, 03 marks)
19. Solve above problem Q.5 (b) by Mohr's circle(graphical) method. (S25 - Q5b-OR, 04 marks)
20. Solve above problem Q.5(c) by Mohr's circle (graphical) method. (Figure no-4) (S25 - Q5c-OR, 07 marks)

Unit VI - Introduction to Computer Aided Structural Analysis

Repeated Questions:

1. **Explain various popular structural analysis software. / Enlist popular structural analysis software.**
    - Appeared in: S24 (Q3a-OR, 03 marks), W23 (Q3a-OR, 03 marks), S25 (Q1a, 03 marks)

Other Important Questions:

1. Explain preprocessor and postprocessor in structural analysis software. (S24 - Q4a-OR, 03 marks)
2. Explain in brief various structural analysis methods and also provide suitability of method for computer programming. (W23 - Q4a-OR, 03 marks)

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