31041 – Theory Of Structures

UNIT 1

PART – A (2 MARK)

1. Define Deflection.
2. What is Flexure rigidity?
3. Define slope.
4. What is stiffness?
5. Define flexural rigidity.
6. State Mohr's theorem II.
7. Drawn the deflected shape of the simply supported beam with central Point load.
8. Define stable structure.

PART – B (3 MARK)

1. What is the maximum deflection for simply supported beam carrying UDL over a span?
2. Differentiate between cantilever beam and propped cantilever beam?
3. What is the maximum Slope and deflection for simply supported beam Carrying point load at mid span?
4. Differentiate between cantilever beam and propped cantilever beam?
5. Explain the types of prop.
6. Define statically determinate and indeterminate structure.
7. Explain the Mohr's theorem I & II.

PART – C (10 MARK)

1. Derive the expression for the maximum slope and deflection in a simply supported beam span 'L' Subjected to UDL 'w' throughout the span
2. A Cantilever AC of span 5m is loaded with a UDL of 5kN/m over a span of 4m from the Fixed end and point load 10kN at point C . A prop B is provided at a distance of 1m from the free end. Draw SFD & BMD
3. Find the deflection and slope at the free end of cantilever of span 4m Carrying a point load 25kN at free end. Take $E=2x10^5$ N/mm^2 and $I=4x10^8$ mm^4 by Using Formula
4. A simply supported beam of 200mm x 400mm and span 4m it carries a UDL of 5kN/m through its length. Determine the slope Take $E=2x10^5$ N/mm^2
5. A Cantilever AC of span 5m is loaded with a udl of 20kN/m over the span. A prop B is provided at a distance of 1m from the free end. Draw SFD &BMD
6. A simply supported beam 5m is 200mm x 300mm of size. It carries a udl of 5 KN/m over the entire span. Find maximum slope and deflection by area moment method. Take $E=1.2x10^5$N/mm^2.
7. A propped cantilever of 6m span is propped at 2m from free end. It is loaded with an udl of 10 kN/m over the span. Determine prop reaction by area moment method. Draw SFD and BMD

UNIT 2

PART – A (2 MARKS)

1. Define prop.
2. What is unstable structure?
3. Define fixed beam.
4. Define point of contra flexure.
5. State the Clapeyron's theorem of three moments.
6. Mention any two advantages of fixed beams.
7. .List various methods of analyzing indeterminate structures.

PART – B (3 MARKS)

1. Define point of contra flexure and how many points of contra flexure will be there in a fixed beam.
2. What is degree of indeterminacy and the Value of degree of indeterminacy of fixed beam?
3. Define statically determinate and indeterminate structure.
4. Give the value of degree of indeterminacy of fixed beam and Explain point of contra flexure.

PART – C (10 MARK)

1. A Fixed beam of span 6m carries two point loads of 10kN and 10kN acts at 2m and 4m respectively from left end and also a uniformly distributed load of 5kN/m over the span. Draw SFD & BMD.
2. A Fixed beam of span 6m carries a point load of 20kN at mid span and UDL of 10kN/m over the entire span. Draw SFD and BMD.
3. A fixed beam of span 6m carries an two point load of 10kN at 2m from each support. Calculate the fixed end moments. Draw SFD and BMD. Also mark the point of contra flexure- Use area moment method'
4. A continuous beam ABC is simply supported at A and C such that AB=6m and BC=5m. The span AB carries on udl of 20kN/m and the span BC carries a point load of 50kN at its mid span. Find the support moments by theorem of three moments. Draw the BMD.

UNIT 3

PART – A (2 MARKS)

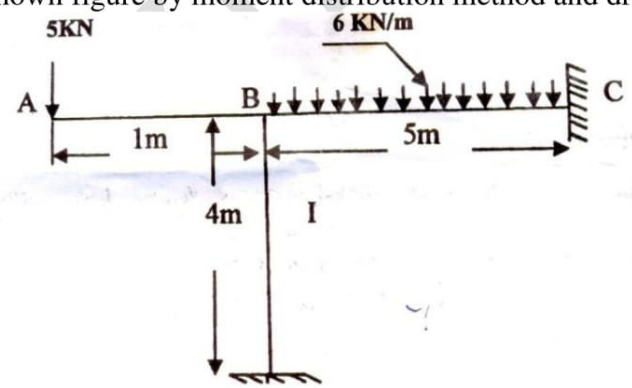
1. Define distribution moment.
2. Define the term stiffness factor
3. Define eccentric loading
4. Define Continuous beam.
5. What is meant by portal frame?
6. Define Carry over moment.
7. What is sway and non sway frame?

PART – B (3 MARKS)

1. What do you meant by sway and non-sway frames?
2. Define carryover moment and carry over factor.
3. Draw the deflected shapes of portal frame.
4. Define distribution factor and distribution moment.

PART – C (10 MARKS)

1. A continuous beam ABC of uniform section with span AB as 4m and BC as 5m is fixed at A and C. the beam is carrying an udl of 20KN/m over the span AB and the span BC carries 60KN at 2m from support B. Find the support moments using Hardy cross method. Draw the BMD
2. Analyze the frame shown figure by moment distribution method and draw BMD



3. A continuous beam ABCD of uniform section with span AB as 4m and BC as 5m is simply supported at A and point D overhang 2m from support C. The beam is carrying an udl of 20KN/m over the span AB and the span BC carries 60KN at mid span and CD carries a UDL of 2kN/m. Find the support moments using Hardy cross method. Draw the BMD
4. ABC is a continuous beam with span AB=10m and BC=8m and is fixed at A and simply supported at C. AB span has an udl of 10kN/m and BC has an udl of 5kN/m. Using the moment distribution method. Draw BMD.
5. A continuous beam ABC with end supports A and C as fixed, have span AB=6m=BC. The span AB carries an udl of 30kN/m throughout the span. The span BC carries a midpoint load of 120kN. Calculate the support moments by moment distribution method. Draw BMD

UNIT 4

PART – A (2 MARKS)

1. In what way the failure of column occurs?
2. Define point of contra flexure.
3. Define Slenderness ratio
4. Define Strut
5. Define Column
6. Define bending stress.

PART – B (3 MARKS)

1. Write the expression for finding maximum combined direct and bending stress.
2. Write assumption made in Euler's theory.
3. Write the end condition for columns
4. Write assumption made in Rankin's theory.
5. Find the slenderness ratio of circular section of 200mm diameter and 3m long with fixed ends.
6. Explain the classification of column.
7. Find the slenderness ratio of circular section of 150mm diameter and 4m long with hinged ends.

PART – C (10 MARKS)

1. A steel tube 4.5m long, 3Ornm external diameter and 3mm thickness is used as strut, Calculate the Euler's is crippling load for the following end condition: (i) when both ends are hinged (ii) when one end is hinged end the other fixed. Take E= $2.1x10^2$ N/mm2.
2. A rectangular masonry pier 1.2m x 0.8m and carries a vertical load of 300kN in the vertical plane bisecting 1.2m side and an eccentricity of 100mm from the geometric axis of the section. Calculate the maximum and minimum stress intensities in the section.
3. A hollow cost iron column whose outside diameter is 250mm has a wall thickness of 25mm. It is 4.5m long and fixed at both ends. Calculate (1) the slenderness ratio, (2) safe rood by Euler's formula with factor of safely of 3, and (3) safe load by Rankin's formula with factor of safety of 4. Take E=$2.1x10^5$N/mm2, f_c= 32ON/mm^2, a=1/1600
4. A hollow rectangular masonry pier 1.2m x 0.8m overall and 0.10m wall thickness carries a vertical load of 300kN in the vertical plane bisecting 1.2m side and an eccentricity of 100mm from the geometric axis of the section. Calculate the maximum and minimum stress intensities in the section.
5. A hollow circular column has 6m long has one of its ends fixed and the other end free and has to support an axial load 500kN. The internal diameter is 0.8 times the external diameter. Allowing a factor of safety of 3, calculate the external diameter.
6. A short hollow cylindrical cast iron column has 300mm external diameter and 60mm wall thickness. A vertical compressive load of 200kN acts an eccentricity of 90mm from the axis. Find the maximum and minimum stress in column.
7. Compare the buckling loads given by Euler's and Rankin's formula for a tubular steel strut 2.3m long, having outer and inner dimensions of 38mm and 33mm respectively. The strut is hinged at both ends. The yield stress f_c=335N/mm^2, a=1/7500 and E= $2.1x10^5$N/mm^2.

UNIT 5

PART – A (2 MARKS)

1. Define the masonry dam
2. Define angle of repose.
3. Give the formula for maximum stress at base of dam?
4. What are the factors affecting stability of dam?
5. What are the failures occurred on dam?
6. What is active earth pressure?
7. Why we are providing retain wall?
8. what is internal friction of soil?
9. Define gravity dam and pressure dam?

PART – B (3 MARKS)

1. Explain the active and passive earth pressure.
2. Derive the core or kern for square section.
3. What are the conditions of stability of a dam?
4. How to find minimum base width and maximum height of dam?
5. Define FOS?
6. Differentiate active and passive earth pressure?
7. How to check stability of retaining wall?

PART – C (10 MARKS)

1. A Trapezoidal masonry dam is 1m wide at top, 4m wide at bottom and 12m high. The dam retains water on its vertical face with free board of 1m. Calculate the maximum and minimum stress at the base of the dam. Check the stability of dam. Take weight of masonry as 22KN/m^3 and weight of water as 9.81KN/m^3 and Co-efficient of friction as 0.6
2. A trapezoidal retaining wall 1m wide at top and 4m wide at bottom is 10m height. It retains earth on its vertical face with top of the wall. The angle of repose is 35º. Take weight of masonry as 22KN/m^3 and weight of earth as 18KN/m^3. Check the stability of retaining wall if the co-efficient of friction as 0.6 and FOS as 1.5
3. Briefly explain the Rankin's theory of earth pressure?
4. Derive the expression of maximum and minimum stress at base of dam.
5. Derive the expression of maximum and minimum stress at base of trapezoidal retaining wall.