



SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR  
APPLIED MECHANICS DEPARTMENT

Assignment No: 01

Date: 29 /12/2017

**Fundamentals Of Statically Determinate Structures**

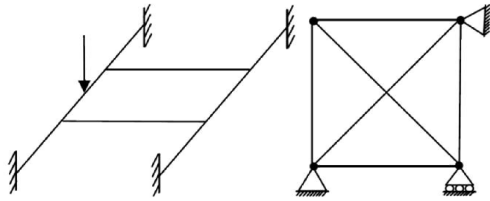
Sub Code 2140603

Title of Subject Structural Analysis - I

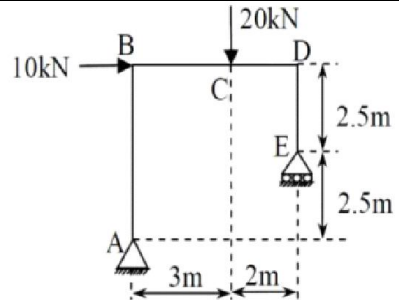
#	Questions
1	Indeterminate structures are better than determinate structures” Comment on the statement.
2	Differentiate between stable and unstable structure.
3	Differentiate static and kinematic indeterminacy. Also explain these terms with respect to fixed beam.
4	State and Explain Principle of Superposition.
5	Explain and prove Maxwell’s reciprocal theorem
6	Find static indeterminacy and kinematic indeterminacy of structures given in Figure – 1.
7	Analyze the rigid jointed portal frame shown in the Figure – 2. Draw shear force diagram, bending moment diagram and axial force diagram
8	Analyze the grid shown in the Figure – 3 and draw shear force, bending moment and twisting moment diagrams.
9	For the portal shown in the Figure – 4, find out moment at B, shear and axial force in member AB.
10	Find out SI and KI of the structures shown in the Figure – 5.
11	Find SI and KI of structures shown at Figure – 6.



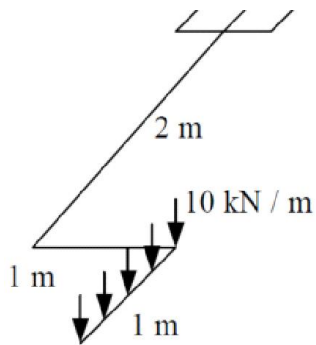
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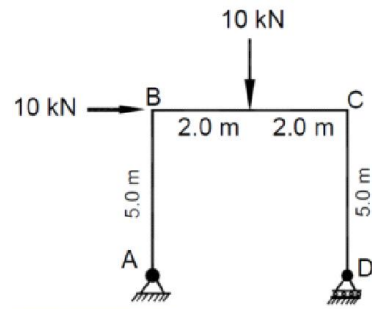
**Figure - 1**



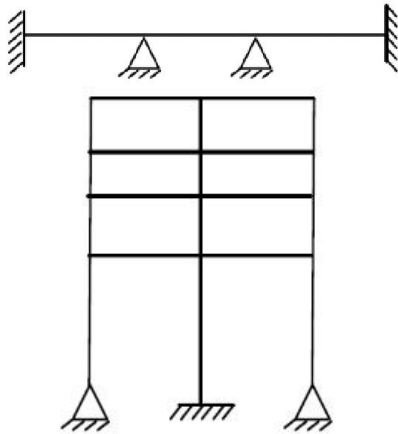
**Figure - 2**



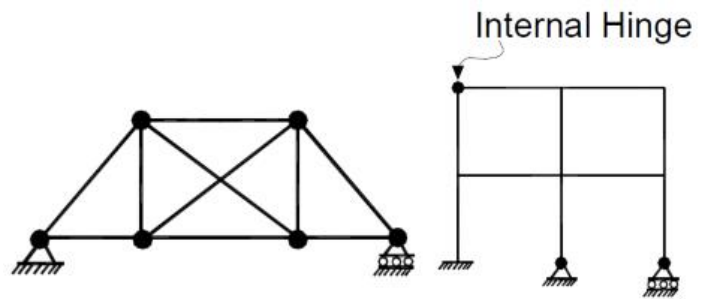
**Figure - 3**



**Figure - 4**



**Figure - 5**



**Figure - 6**

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Date of Submission	12/02/2018



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**APPLIED MECHANICS DEPARTMENT**

Assignment No:

Date:

**COLUMNS AND STRUTS**

Sub Code

Title of Subject

#	Questions
1	Write the equations for Euler's crippling load for different end conditions of a long column.
2	Write down any four assumptions made for derivation of Euler's crippling load formula.
3	Derive an expression for crippling load when one end of column is fixed and the other end is free.
4	A column one meter long has cross sectional area of 9 cm <sup>2</sup> . Find the slenderness ratio if the section is (a) circular, (b) square and (c) hollow circular with inner radius half the outer radius.
5	A hollow cast iron column has outside diameter 200 mm and thickness of 20 mm. It is 4.5 m long and fixed at both ends. Calculate the safe load and ratio of Euler's and Rankine's critical load. For cast iron $F_c = 550 \text{ N/mm}^2$ , $\alpha = 1/1600$ and $E = 0.8 \times 10^5 \text{ N/mm}^2$ .
6	A hollow cylindrical cast iron column is 4 m long with both ends fixed. Find the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take internal diameter as 0.8 times the external diameter. Take $\sigma_c = 500 \text{ MPa}$ and Rankine's constant $\alpha = 1/1600$ .
7	A 2.5 m long pin ended column of square cross section is made up of timber. Using Euler's formula, find out size of the column with a factor of safety 2 for 250 kN axial load. Consider $E = 12.5 \text{ GPa}$ , Allowable stress in axial compression = 12 MPa.
8	A circular column has both end hinged with length of 6.0 m and diameter of 160 mm. If the yield strength of the material is 410 N/mm and rankine's constant is 1/4800, calculate Euler's critical load and rankine's critical load.
9	A solid cast iron circular column of 4.0 m height is to be erected such that its one end remains fixed and other end remains hinged. Find the size of the section, if column has to carry a safe axial load of 300 kN. Take factor safety of 5, $f_c = 500 \text{ N/mm}^2$ , Rankine's constant $\alpha = 1/1500$ .

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Assignment No: 03

Date: 05/03/2018

DIRECT AND BENDING STRESSES

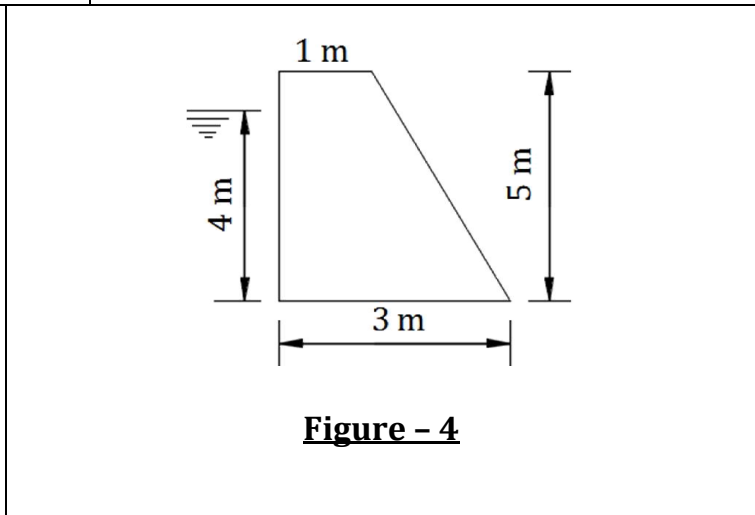
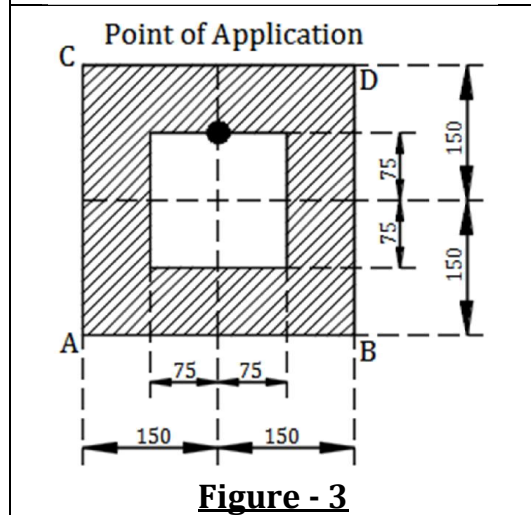
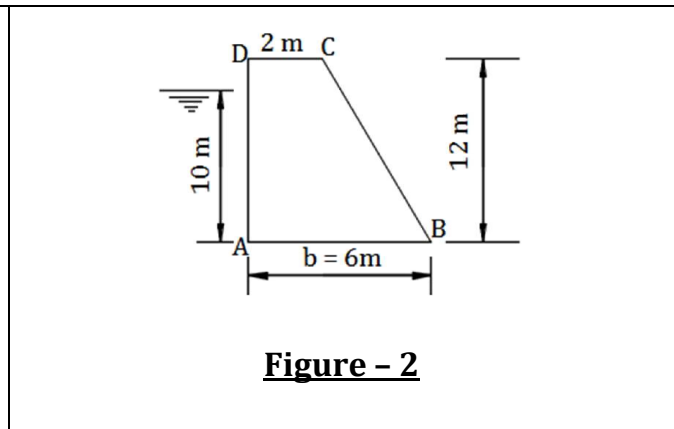
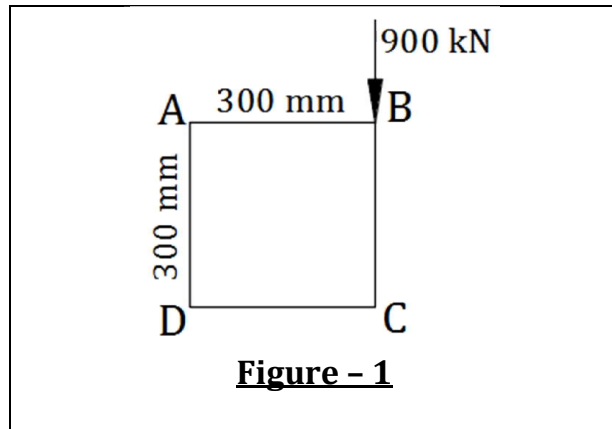
Sub Code 2140603

Title of Subject Structural Analysis - I

#	Questions
1	A rectangular pier of size 300 mm X 300 mm is subjected to a compressive load of 900 kN at one of the corner. Find the stress intensities at all four corners of the pier and draw stress distribution diagram. If the load is acting at the center of the pier, also draw the stress distribution diagram. Refer <b>Figure - 1</b> .
2	A concrete dam of trapezoidal section has a top width 2 m, bottom width of 6 m and height 12 m. It retains water up to 10 m on vertical side. Determine the maximum and minimum stress intensities at the base of the section. The density of the material used is 24 kN/m <sup>3</sup> and density of water as 10 kN/m <sup>3</sup> . Refer <b>Figure - 2</b> .
3	A masonry chimney 20 m high is of circular section, the external diameter and internal diameter of the section being 6 m and 4 m respectively. The chimney is subjected to horizontal wind pressure of 1.2 kN/m <sup>2</sup> of projected area. Find the maximum and minimum stresses at the base. Take unit weight of masonry as 20 kN/m <sup>3</sup> .
4	A short column has a square section 300 mm X 300 mm with a square hole of 150 mm X 150 mm as shown in <b>Figure - 3</b> . It carries an eccentric load of 1500 kN, located as shown in figure. Determine the maximum and minimum stresses across the section.
5	A masonry retaining wall is 6 m high, 0.75 m wide at top and 2 m wide at bottom. The wall is retaining soil up to top. The face of the wall on soil side is vertical. The lateral pressure due to soil varies from zero at top to 3.2 kN/m <sup>2</sup> at bottom. Specific weight of masonry is 24 kN/m <sup>3</sup> . Draw stress distribution at base of wall due to self-weight of wall alone and due to self-weight of wall and soil pressure, and shear force at section under load. Draw BMD.
7	A cylindrical chimney 24 m high of uniform circular section is 4 m external dia. & 2 m internal dia. It is subjected to a horizontal wind pressure of 1000 N/mm <sup>2</sup> . If the coefficient of wind pressure is 0.66 & unit wt. of masonry is 22 kN/m <sup>3</sup> . Find the maxm & minm stresses at the base of the section.
8	For a trapezoidal masonry dam as shown in the <b>Figure - 4</b> , plot the stress distribution at the base. Take density of masonry = 20 kN/m <sup>3</sup> .



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Date of Submission	26/03/2018



**SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR**  
**APPLIED MECHANICS DEPARTMENT**

Assignment No:

Date:

**DISPLACEMENT OF DETERMINATE BEAMS AND PLANE TRUSS**

Sub Code

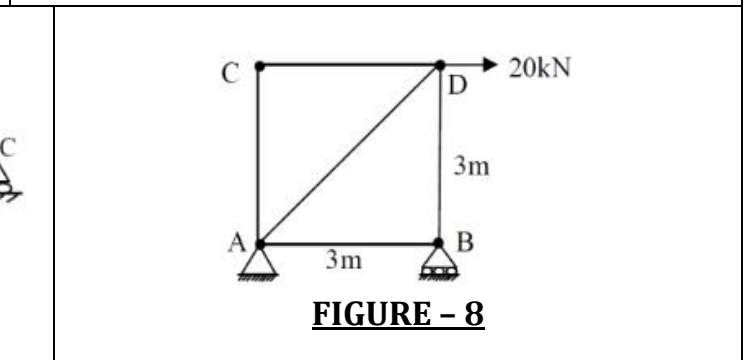
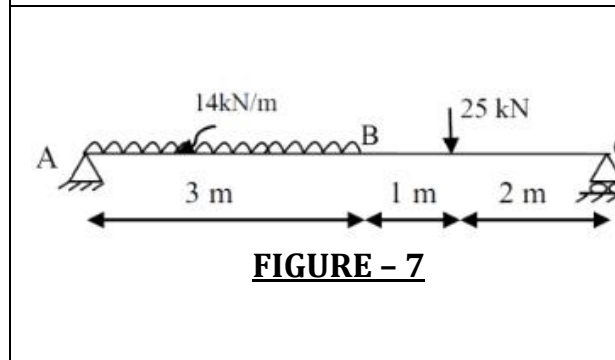
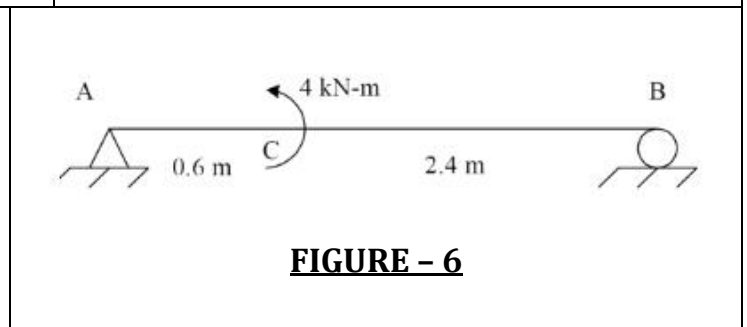
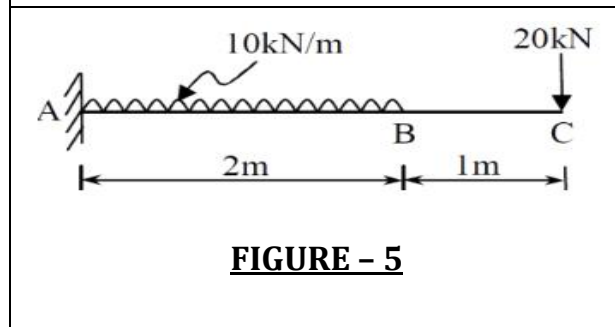
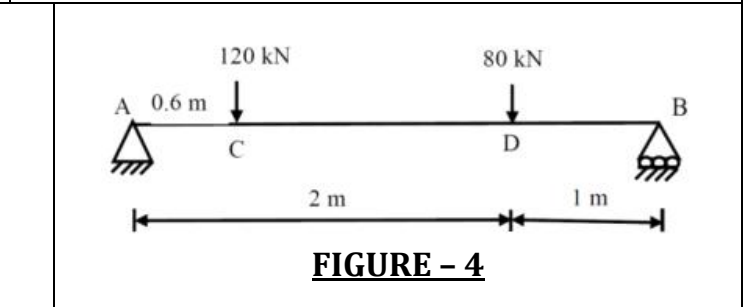
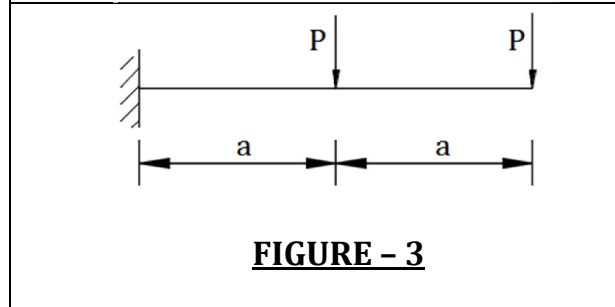
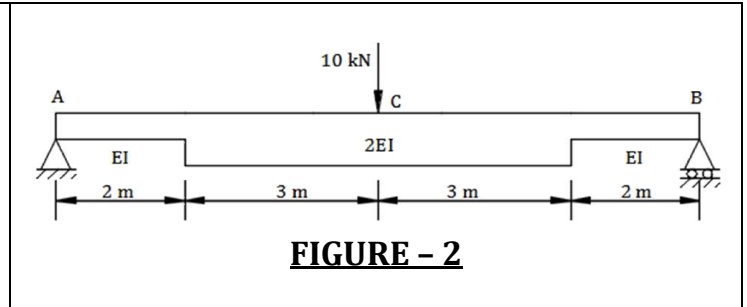
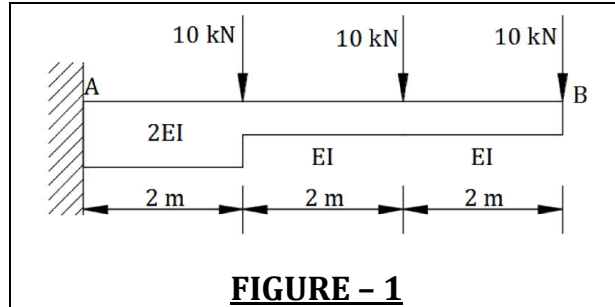
Title of Subject

#	Questions
1	Differentiate between the real beam and conjugate beam
2	Derive an expression of slope at supports for the simply supported beam subjected to point load at the center of the beam.
3	For the simply supported beam subjected to UDL, derive the expressions for slope at support and deflection at the mid span using moment area method.
4	Find the slope and deflection at the free end B of a cantilever beam AB as shown in Figure – 1 by moment area method. Take $I = 2 \times 10^8 \text{ mm}^4$ , $E = 2 \times 10^5 \text{ N/mm}^2$ .
5	Find the slope and deflection at the center C of a simply supported beam AB as shown in Figure – 2 by moment area method. Take $I = 2 \times 10^8 \text{ mm}^4$ , $E = 2 \times 10^5 \text{ N/mm}^2$ .
6	Find the deflection and slope for a cantilever beam shown in Figure – 3, using moment area method.
7	A simply supported beam of 3 m span carries two point loads of 120 kN and 80 kN at a distance of 0.6 m and 2 m from the left support. If for the beam $I = 16 \times 10^8 \text{ mm}^4$ and $E = 2.1 \times 10^5 \text{ N/mm}^2$ , Calculate the deflection under loads using Macaulay's method. Refer Figure – 4.
8	A cantilever 2 m long is loaded as shown in Figure – 5. Find slope and deflection at free end using Macaulay's method. Take $E = 200 \text{ GPa}$ and $I = 160 \times 10^6 \text{ mm}^4$ .
9	For the beam shown in figure – 6, determine the deflection and slope at C using Macaulay's method.
10	Find the slope at A and deflection under B for the beam shown in the Figure – 7 using Macaulay's method. Take $EI = 3000 \text{ kN m}^2$
11	Determine the horizontal deflection and vertical deflection at D, of a truss shown in Figure – 8. Using unit load method. AE is same for all members.
12	For the truss shown in figure – 9, calculate horizontal deflection at C by unit load method. Area of member AB is $400 \text{ mm}^2$ . Area of AC and BC is $600 \text{ mm}^2$ .
13	Find out slope and deflection at C for the beam shown in Figure – 10 by conjugate beam method.
14	Find the slope and deflection at point A and B for the beam shown in the Figure – 7 using conjugate beam method. $EI = 3000 \text{ kN m}^2$
15	Find the deflection and slope under load 100 kN using conjugate beam method. Refer Figure – 11. Take $E = 200 \text{ GPa}$ and $I = 150 \times 10^6 \text{ mm}^4$ .



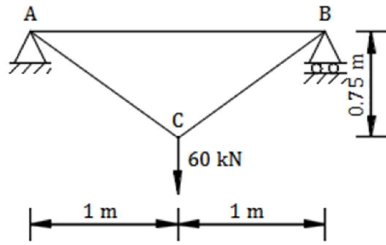
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16	Find the slope and deflection at point B and C for the beam shown in the Figure - 12. Take $EI = 3000 \text{ kN m}^2$
17	Find the slope at A and deflection under C for the beam shown in the Figure - 13. Take $EI = 3000 \text{ kN m}^2$

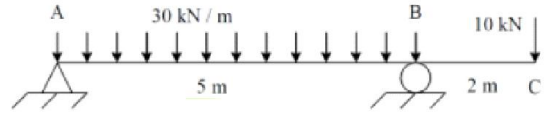




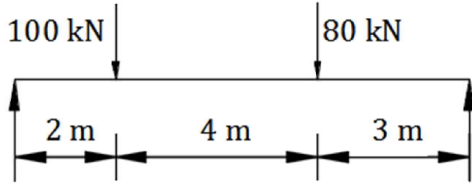
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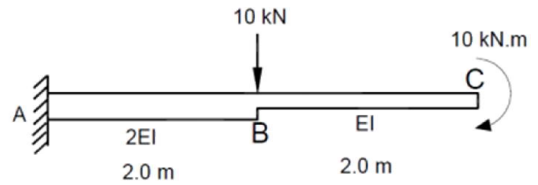
**FIGURE - 9**



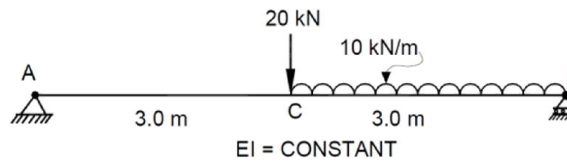
**FIGURE - 10**



**FIGURE - 11**



**FIGURE - 12**



**FIGURE - 13**

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