Assignment 2

The due date for submitting this assignment has passed. Due on 2016-08-02, 23:59 IST.

Submitted assignment

1) A folding table is made by a uniform wooden top of the size 60 cm x 90 cm hinged to a wall and held up by two strong light weight (negligible weight) supports screwed on its sides, making an angle of 30° from the table top (see figure 1). The screws can be taken to be like pin-joints. The supports are attached to the wall by pin-joints. The weight of the table top is 20 N.

(a) Make the free body diagram of the table top and the supports.

(b) Find all the forces acting on the table top and on one of the supports. Choose the correct answers from choices given below.

1) A folding table is made by a uniform wooden top of the size 60 cm x 90 cm hinged to a wall and held up by two strong light weight (negligible weight) supports screwed on its sides, making an angle of 30° from the table top (see figure 1). The screws can be taken to be like pin-joints. The supports are attached to the wall by pin-joints. The weight of the table top is 20 N.

(a) Make the free body diagram of the table top and the supports.

(b) Find all the forces acting on the table top and on one of the supports. Choose the correct answers from choices given below.

- On table top: wall applies a horizontal force of 10 N going out of the wall and a vertical force of $10 \sqrt{3}$ N pointing up. On each support there is compressive force of 20 N along the support.
- On table top: Wall applies a vertical force of 20 N pointing up and a horizontal force of $10 \sqrt{3}$ N going into the wall. On each support there is compressive force of 10 N along the support.
- On table top: Wall applies a vertical force of 10 N pointing up and a horizontal force of $10 \sqrt{3}$ N going into the wall. On each support there is compressive force of 10 N along the support.
- On table top: Wall applies a horizontal force of $10 \sqrt{3}$ N going out of the wall and a vertical force of 10 N pointing up. On each support there is compressive force of 16 N along the support.

No, the answer is incorrect.

Score: 0
24/07/2018

**Engineering Mechanics - - Unit 3 - Week 2 Lectures**

**Week 3 Lectures**

**Week 4 Lectures**

**Week 5 Lectures**

**Week 6 Lectures**

**Week 7 Lectures**

**Week 8 Lectures**

**Week 9 Lectures**

**Week 10 Lectures**

**Week 11 Lectures**

**Week 12 Lectures**

**Review Problems**

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**Accepted Answers:**

On table top : Wall applies a vertical force of 10 N pointing up and a horizontal force of 10√13 N going ir the wall. On each support there is compressive force of 10 N along the support.

1) Consider a net torque \( \tau = \tau_x \hat{i} + \tau_y \hat{j} + \tau_z \hat{k} \) due to several forces whose lines of action intersect the z axis. In that case, which of the following is true?

- \( \tau_x \neq 0, \tau_y = 0, \tau_z \neq 0 \)
- \( \tau_x \neq 0, \tau_y \neq 0, \tau_z = 0 \)
- \( \tau_x = 0, \tau_y \neq 0, \tau_z = 0 \)
- \( \tau_x = \tau_y = \tau_z = 0 \)

No, the answer is incorrect.

Score: 0

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2) In a statically indeterminate system in equilibrium, the number of equations relating the forces

- equal to the number of unknown forces.
- is more than the number of unknown forces.
- is less than the number of unknown forces.
- not equal to the number of unknown forces.
- None of the above is correct.

No, the answer is incorrect.

Score: 0

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3) Consider a simply supported two dimensional beam as shown in figure 4.(a). If the beam is converted into a fixed-fixed beam as shown in figure 4.(b), then the degree of static indeterminacy will

- increase by 3
- increase by 2
- decrease by 3
- decrease by 1
- increase by 1

No, the answer is incorrect.

Score: 0

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4) A man weighing 600N stands on a horizontal beam (hinged on a wall) of negligible weight at point C and holds a massless rope passing over two smooth pulleys. The rope is attached to point B on
3) The beam as shown in Fig (5) below. If the system is in equilibrium, the tension in the string is

- 200 N
- 300 N
- 400 N
- 600 N
- 1200 N

No, the answer is incorrect.
Score: 0
Accepted Answers:
400 N

6) There are large concrete blocks of size 2 cm × 1 cm × 1 cm. These blocks are moved by a crane from one place to another. To help lift these blocks, 4 rings are attached at the mid points A, B, C and D of the sides of their upper surfaces and cables OA, OB, OC and OD are hooked at each of these points. The four cables are attached to a common ring at point O that lies right above the mid point of the upper surface at a height of 1 m (see Fig. 6). If each block weighs 45,000 N, with its centre of gravity at the middle of the block, find the tension in each cable when the block is held stationary, assuming tension to be equal in all cables.

- 12040 N
- 14050 N
- 11000 N
- 17320 N

No, the answer is incorrect.
Score: 0
Accepted Answers:
14050 N

7) A square plate ABCD is kept on a frictionless floor. At the right hand upper corner B, it is being pulled by a force \(50 \hat{i} - 50 \hat{j}\) parallel to its diagonal AC. At the diagonally opposite corner D, it is being pushed by a force \(70 \hat{i} \) parallel to its side CD, as shown in Fig 8.

(a) Is it possible to apply a third force at the centre of the square to keep it in equilibrium?

(b) Is it possible to apply a force on any other point on diagonal BD to achieve equilibrium? How far from the centre O should the force be applied?
(c) Of the four sides, AB, BC, CD and DA, on which side is it possible to apply a force and keep the square in equilibrium? (Hint: Forces must be concurrent)

<table>
<thead>
<tr>
<th>Option</th>
<th>Correct Answer</th>
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<tbody>
<tr>
<td>(a) Yes</td>
<td>No (c) on BC and AD</td>
</tr>
<tr>
<td>(a) No (b) Yes, if square has side b then at distance 0.38b from B (c) on BC and AD</td>
<td></td>
</tr>
<tr>
<td>(a) No (b) Yes, if square has side b then at distance 0.58b from B (c) on BC and CD</td>
<td></td>
</tr>
<tr>
<td>(a) No (b) Yes, if square has side b then at distance 0.58b from B (c) on BC and AD</td>
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</tbody>
</table>

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) No (b) Yes, if square has side b then at distance 0.58b from B (c) on BC and AD

8) A simple lightweight truss ABC shown in the Figure is attached to a wall and holds a flowerpot weighing 50N. Calculate the forces in each of its members, neglecting their own weight.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>F_{AC} = 90 N (tensile), F_{BC} = 75 N (compressive), F_{AB} = 50 N (compressive)</td>
<td></td>
</tr>
<tr>
<td>F_{AC} = 54 N (tensile), F_{BC} = 45 N (compressive), F_{AB} = 30 N (compressive)</td>
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</tr>
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No, the answer is incorrect.
Score: 0
Accepted Answers:
F_{AC} = 90 N (compressive), F_{BC} = 75 N (tensile), F_{AB} = 50 N (tensile)

9) A truss has 12 members and 6 joints. Number of members that can be removed without making the truss unstable are

<table>
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<tr>
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<tbody>
<tr>
<td>1</td>
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<td>3</td>
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<td>4</td>
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</table>
10) Consider a truss PQR loaded at P with a force F as shown in the figure. The tension in the member QR is

- 0.36 F
- 0.87 F
- 0.12 F
- 0.63 F

No, the answer is incorrect.
Score: 0
Accepted Answers:
3

11) The truss shown in the figure is

- stable and indeterminate
- stable and determinate
12) In the equation \( 2j - 3 = m \) relating the number of joints and members in a simple truss, the factor 2 multiplying \( j \) arises because (chose the most appropriate statement)

- there are two possible directions -- compressive or tensile -- for the force applied by each member connected to the joint
- there are only two equilibrium conditions to be satisfied at each joint
- a simple truss is supported at two ends
- a simple truss is a two-dimensional structure

No, the answer is incorrect.
Score: 0

Accepted Answers:
stable and determinate

13) A truss consisting of members AD, DC, AB, BD and BC is subjected to a vertical force of 120 N at joint B as shown in the figure. The members AD and DC are each of length 1 m. The magnitude of force in the member BD is

- 40 N
- 0
- \( 20 \sqrt{2} \) N
- 120 N

No, the answer is incorrect.
Score: 0

Accepted Answers:
0

14) The truss EFGHIJ is shown in the figure. Which of the following statements is most appropriate for it

- unstable and indeterminate
- unstable and determinate

No, the answer is incorrect.
Score: 0
The truss is a simple truss
- The truss is not a simple truss
- If members EI and FH are removed, the truss becomes a simple truss
- If members EI and FJ are removed, the truss becomes a simple truss

No, the answer is incorrect.

Score: 0

Accepted Answers:
- If members EI and FH are removed, the truss becomes a simple truss

The force in the member PR of the truss shown in the figure is

- 15kN compressive
- 15 kN tensile
- 30kN compressive
- 30kN tensile

No, the answer is incorrect.

Score: 0

Accepted Answers:
- 30kN compressive