ONWARD UPWARD

MARK MATTSON, PE

Name: MM
Course: CTC485   Assignment: FE Review
Description: Structural Analysis (v1.1)
Date: 2/12/2022   Page: 1 of 10

These problems address topics from the NCEES FE Civil CBT Exam Specifications at https://ncees.org/wp-content/uploads/FE-Civil-CBT-specs-1.pdf, see below.

FE Civil Review 2022
Structural Analysis

NCEES Fundamentals of Engineering (FE)
CIVIL CBT Exam Specifications

Effective Beginning with the July 2020 Examinations

YouTube Playlist

Knowledge	Number of Questions
11. Structural Engineering	**10–15**

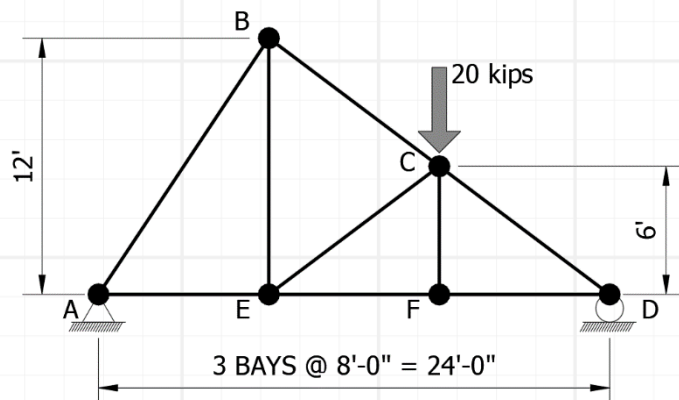|		
A.	Analysis of statically determinant beams, columns, trusses, and frames	Analysis
B.	Deflection of statically determinant beams, trusses, and frames	
C.	Column analysis (e.g., buckling, boundary conditions)	
D.	Structural determinacy and stability analysis of beams, trusses, and frames	
E.	Elementary statically indeterminate structures	
F.	Loads, load combinations, and load paths (e.g., dead, live, lateral, influence lines and moving loads, tributary areas)	Design
G.	Design of steel components (e.g., codes and design philosophies, beams, columns, tension members, connections)	
H.	Design of reinforced concrete components (e.g., codes and design philosophies, beams, columns)	

Notes
V1.00 published 2/12/2022
V1.1 title sheet 3/29/2022

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A. Analysis of statically determinate beams, columns, trusses and frames

Question 1: The axial force in member EC due to the applied loads shown in the truss below is most nearly:

A. 10 kips

B. 13.33 kips

C. 16.67 kips

D. 20 kips

20 kips

12'

6'

3 BAYS @ 8'-0" = 24'-0"

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A. Analysis of statically determinate beams, columns, trusses and frames

Question 2: The moment reaction at point A due to the applied loads shown in the frame below is most nearly:

A. 165 kip-ft

B. 185 kip-ft

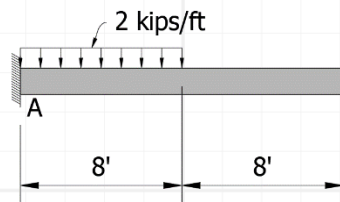C. 255 kip-ft

D. 305 kip-ft

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B. Deflection of statically determinate beams, columns, trusses and frames

Question 3: The beam below is a W18x71 wide flange steel section bent about its strong-axis. It is rigidly connected to the support at A. The magnitude of the maximum deflection in the beam below due to the applied loads (ignore self-weight) is most nearly:
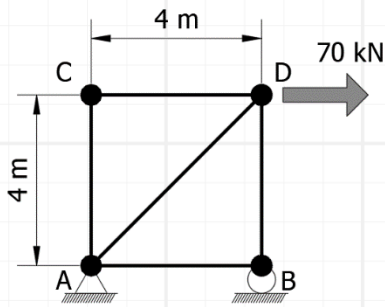
2 kips/ft

A

8'   8'

A. 0.01 in

B. 0.05 in

C. 0.09 in

D. 0.12 in

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B. Deflection of statically determinate beams, columns, trusses and frames

Question 4: The truss below is composed of steel members that are 5 cm x 5 cm square with modulus of elasticity of 200,000 MPa. Ignore the self-weight of the structure and assume compression members are braced against buckling. The magnitude of the horizontal displacement at point D due to the applied loads is most nearly:
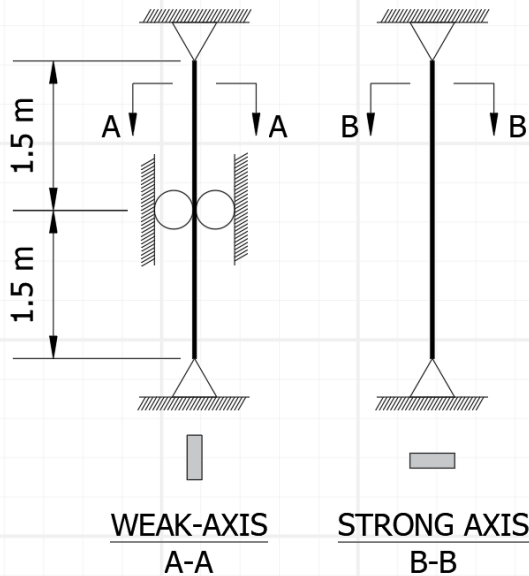
4 m

70 kN

C   D

4 m

A   B

A. 1 mm

B. 2 mm

C. 3 mm

D. 4 mm

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C. Column analysis (e.g., buckling, boundary conditions)

Question 5: The bar below is used as a column to resist axial force in compression. The column is solid steel with a cross section of 2-cm x 6-cm and modulus of elasticity of 200 GPa. It is simply supported at its ends for both the strong and weak axis and braced at its mid-span in its weak axis only. Ignoring self-weight, the theoretical Euler buckling load that will cause the bar to buckle is most nearly:
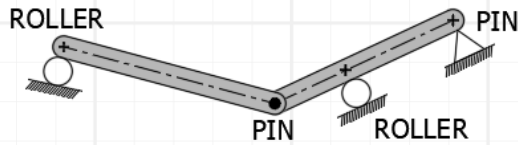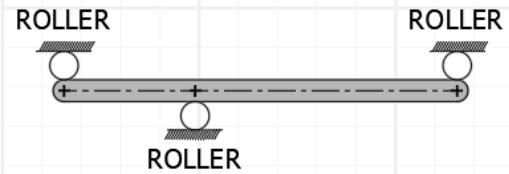
A. 10 kN

B. 35 KN

C. 79 kN

D. 316 kN

1.5 m

1.5 m

A | A   B | B

WEAK-AXIS
A-A

STRONG AXIS
B-B

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D. Structural determinacy and stability analysis of beams, trusses, and frames

Question 6: Which of the structures below are both <u>stable</u> and <u>statically determinate</u>? Select all that apply.
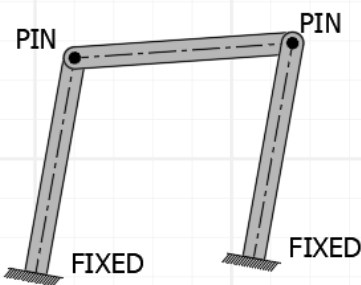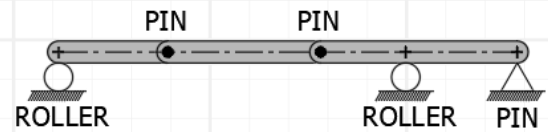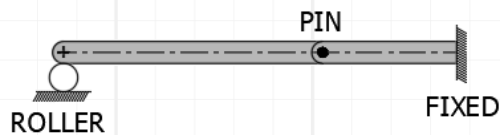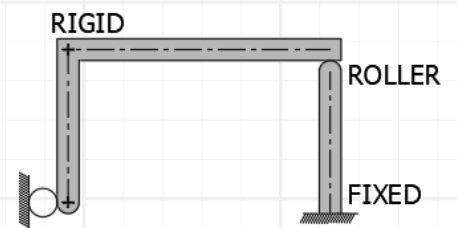
(a)
ROLLER
PIN
PIN   ROLLER

(b)
ROLLER   ROLLER
ROLLER

(c)
PIN   PIN
FIXED   FIXED

(d)
PIN   PIN
ROLLER   ROLLER PIN

(e)
PIN
ROLLER   FIXED

(f)
RIGID
ROLLER
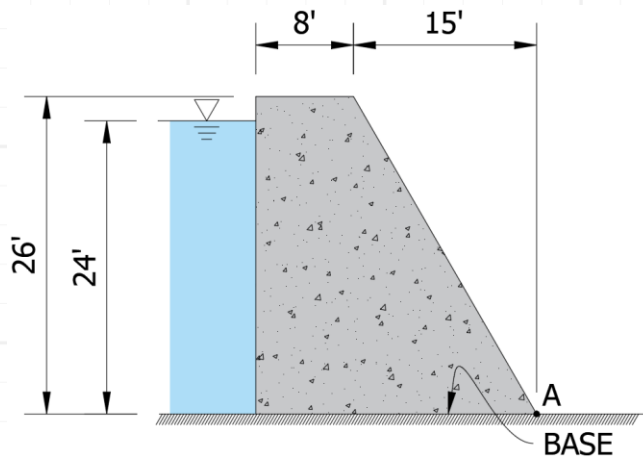FIXED

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D. Structural determinacy and stability analysis of beams, trusses, and frames

Question 7: A concrete dam section is shown below. The unit weight of concrete is 150 pcf and the unit weight of water is 62.4 pcf. Assume the coefficient of friction between the base and the ground is taken as 0.35 and uplift is <u>not</u> a consideration. A stability analysis of the dam section based <u>only</u> on the weight of concrete and lateral water pressure indicates that the dam will most likely:
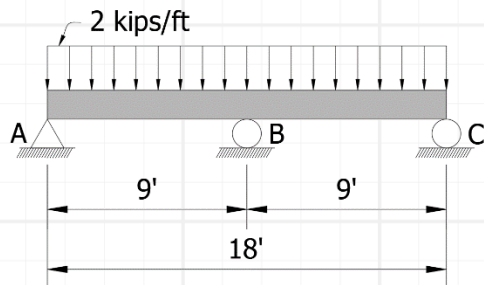

A. <u>Resist sliding</u> along its base and <u>resist overturning</u> about point A

B. <u>Fail in sliding</u> along its base, but <u>resist overturning</u> about point A

C. <u>Resist sliding</u> along its base, but <u>fail in overturning</u> about point A

D. <u>Fail in sliding</u> along its base and <u>fail in overturning</u> about point A

ONWARD
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E. Elementary statically indeterminate structures

Question 8: The beam below is a W18x71 steel wide flange section. The uniform load includes the self-weight of the beam. The magnitude of the vertical support reaction at point A due to the applied loads is most nearly:
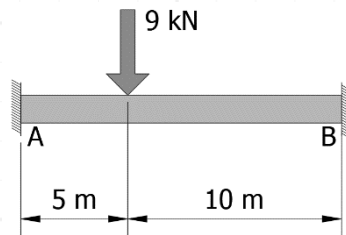
2 kips/ft

A   B   C

9'   9'

18'

A. 6.75 kips

B. 9.00 kips

C. 13.5 kips

D. 22.5 kips

ONWARD
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E. Elementary statically indeterminate structures

Question 9: The beam below is a W18x71 steel wide flange section rigidly connected between fixed supports. Ignore the self-weight of the beam. The maximum vertical reaction at Support A is most nearly:

9 kN

A

B

5 m   10 m

A. 3 kN

B. 6 kN

C. 7 kN

D. 8 kN