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Daffodil International University

B. Sc. in Civil Engineering

Midterm Examination, Fall - 2024

Course Code: CE 311	Course Title: Structural Analysis	
Section: BN1, BN2	Level-Term: 3-1	Teacher's Initial: MR
Full Marks: 25	Date: September 30, 2024	Time: 1.5 Hours

Note: There are three questions in total. Answer all of them. Assume any reasonable value if not provided. The figures in the right-hand margin indicate full marks.

1. a). Calculate the maximum shear force and maximum moment at point "C" of a simply supported beam having 60 ft length due to the multiple wheel loads as shown in Figure-01. *[CO3, C3]* [06]

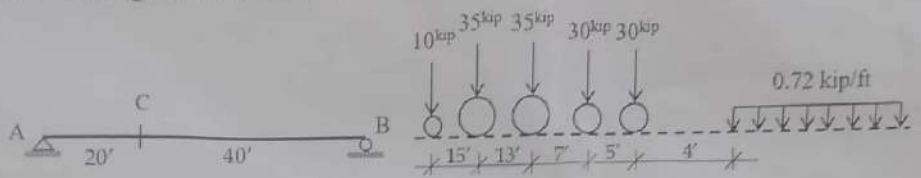


Figure-01

b). Illustrate the influence lines with ordinate for the beam shown in Figure-02. [04]
(i) Vertical reactions at points B and D, (ii) Shear forces at just left and right of support D, (iii) Vertical reaction at point D and shear force at point E and (iv) Moments at C and E. *[CO3, C3]*

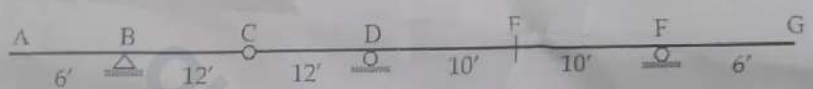


Figure-02

2. a). Calculate the vertical displacement of joint A of the truss shown in Figure-03 using the method of virtual work. Each bar is made of steel and has a cross-sectional area of 600 mm^2 and E= 200 GPa. *[CO4, C4]* [06]

The virtual-work equation for the truss is, $1.\Delta = \Sigma \frac{nNL}{AE}$

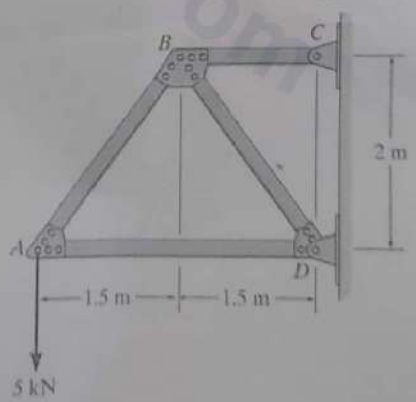


Figure-03

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b). Calculate the displacement of point B of the steel beam shown in Figure-04 using the method of virtual work. Take $I = 500 \times 10^6$ mm^4 and E = 200 GPa. *[CO4, C4]* [04]

The virtual-work equation for the beam is, $1.\Delta = \int_0^L \frac{mM}{EI} dx$

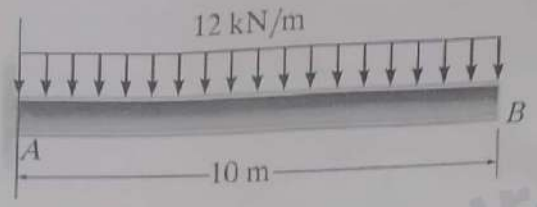
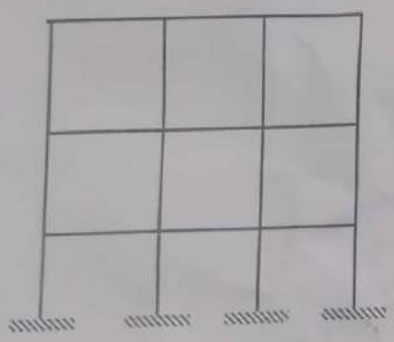
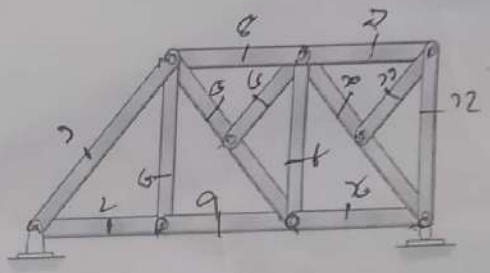


Figure-04

3. Explain external, internal and geometrical stability and determinacy of the structures shown in Figure-05. Also identify the DOI of the indeterminate structures. *[CO1, C2]* [05]



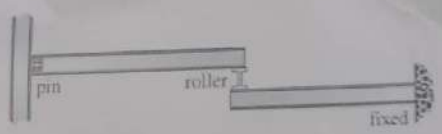
(i)



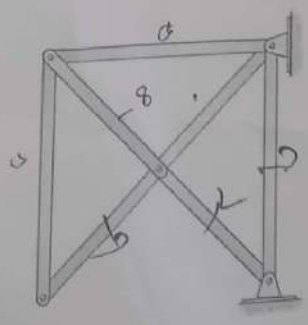
(ii)



(iii)



(iv)



(v)

Figure-05