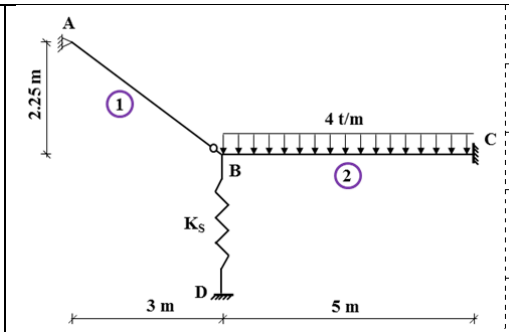
Fayoum University	**Structural Analysis & Mechanics III**	Third Civil Year 2015-2016
Department of Civil Engineering	2nd Term - Mid-Term Exam	Time: 105 min.
Name (باللغة العربية) :	Sec (...) N (...)	رقم الجلوس (.....)

Please solve in sequence similar to that adopted in lecturers and illustrate the DOF and connectivity on the structure.

Q1. Use Matrix Displacement Method (Assembly Approach) to draw B.M.D., S.F.D. and N.F.D. for the illustrated structure. Also, find the force in the spring. Consider the axial deformation for member BC.

Problem



E=2100 t/cm^2

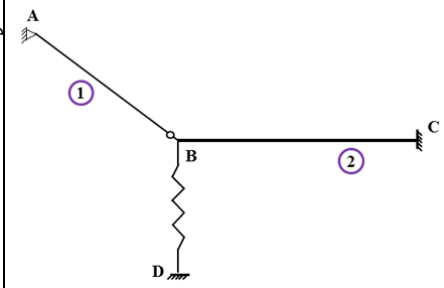
Area of link AB=10 cm^2

Area of beam BC= 100 cm^2

Inertia of beam BC=20833.333 cm^4

Spring stiffness K_s=7 t/cm

D.O.F & connectivity



Find P

$\mathbf{P} = \{\ \}$

Member AB

Element Stiffness Matrix in Local Coordinates

$\tilde{\mathbf{K}} = [\ \ ]$

Member AB

Transformation Matrix

$\mathbf{T} = [\ \ ]$

Element Stiffness Matrix in Global Coordinates

$\mathbf{K} = [\ \ ]$

Member BC

Transformation Matrix

$\mathbf{T} = [\ \ ]$

Element Stiffness Matrix in Global Coordinates

$\mathbf{K} = [\ \ ]$

V-C Table

Truss

Member	end P	end q
1		

Frame

Member	end P	end q
2		

Structure Stiffness Matrix

Symbolic

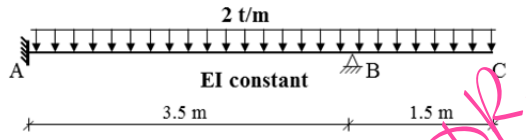
$\mathbf{K} = [\ \ ]$

Numbers

$\mathbf{K} = [\ \ ]$

Solution of Equations	$\mathbf{U}=\mathbf{K}^{-1}\mathbf{P}=\left\{\quad\right\}$	*Force in member AB*	$\mathbf{U}=\left\{\quad\right\}$	$\tilde{\mathbf{U}}=\left\{\quad\right\}$	$\tilde{\mathbf{P}}=\left\{\quad\right\}$	**Choose** **Tension** **Compression**
Force in member BC	$\tilde{\mathbf{U}}=\left\{\quad\right\}$	$\tilde{\mathbf{P}}=\left\{\quad\right\}$	*M, N & Q Diagrams*	**B.M.D.** **S.F.D.** **N.F.D.**		

Q2. Use the reduction theory to find the deflection at C. Use statically determinate system to draw B.M.D. of applied loads and use statically indeterminate system to draw B.M.D. due to unit downward load at C.

Problem		**Moment due to applied loads**	**determinate system**
Moment due to unit load	**indeterminate system**		**M_0 diagram**
	M_1 diagram	$\delta_c =$	

$$\delta_c = \frac{\cdots\cdots\cdots\cdots}{EI}$$