

M R
Ahmed Mahdy



استاتيكا	فيزياء
الكثرونيات	دوائر كهربية
هيدروليكا	ميكانيكا الانشآت

مدرس خصوصي

حضورى

اونلاين

بحصل الطالب علي

مقاطع فيديو هات لشرح المقرر بشكل وافى

ملخص للمادة Pdf للمذكرة واطراجة

محاضرات مباشرة علي برنامج زووم

مناقشة الأجزاء الغير مفهومة

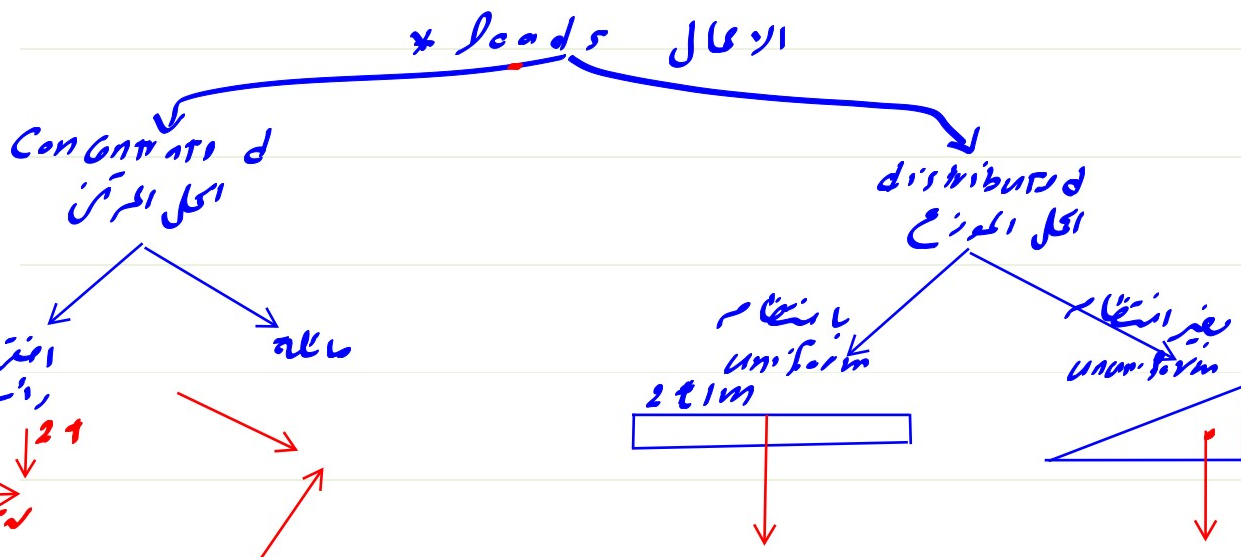
تواصل مستمر مع معلم المادة

للتواصل

0567630097

0565657741

Lecture No (1) Fundamental of structures

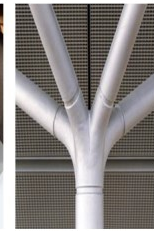
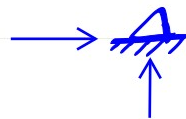


* انواع الدعامات (Supports)

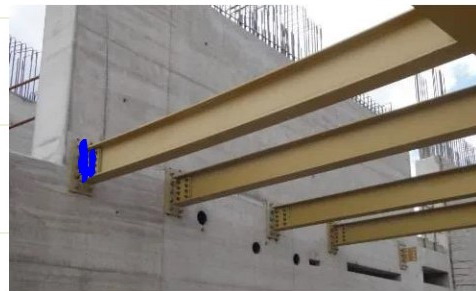
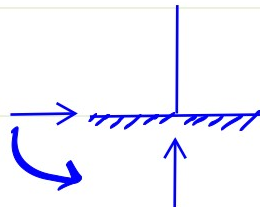
① roller support



② hinged support



③ fixed support



معادلات الاتزان (Equations of equilibrium)

$$\sum F_x = 0, \quad \sum F_y = 0, \quad \sum M = 0, \quad \sum M_h = 0 \text{ (e.g.)}$$

determinacy and stability



Statically determinate & indeterminate structures

1- Beam, arch

- . $r < c + 3$ ($r < 3m$) Unstable
- . $r = c + 3$ ($r = 3m$) Statically determinate
- . $r > c + 3$ ($r > 3m$) Statically indeterminate

The Degree of freedom (n) = $r - (C + 3)$

The Degree of indeterminacy (ID) = $r - (C + 3)$

.r = reactions

C = connection

3 = Equations of Equilibrium

.m = Members

2- Frame

- $3m + r < 3j + c$ Unstable
- $3m + r = 3j + c$ Statically determinate
- $3m + r > 3j + c$ Statically indeterminate

Degree of freedom (n) = $3m + r - (3j + c)$

.m = Members

.j = Joints

3- Truss

- $m + r < 2j$ Unstable
- $m + r = 2j$ Statically determinate
- $m + r > 2j$ Statically indeterminate

Degree of freedom (n) = $m + r - (2j)$

.m = Members

.j = Joints

In general :

	If		The structure is
Number of <u>unknown</u>	<	number of equations	Unstable
Number of unknowns	=	number of equations	Statically <u>determinate</u>
Number of unknowns	>	number of equations	Statically <u>determinate</u>

Tutorial No (1)

Analysis of statically determinate structures

Example 1

Check for the beam shown below as statically determinate or statically indeterminate. If statically indeterminate calculate degree of indeterminacy and the number of degrees-of-freedom



$$V > C + 3$$

$$4 > 0 + 3 \quad \text{Statically indeterminate}$$

$$4 - 3 = 1 \quad \text{ED} = 1$$

Example 2

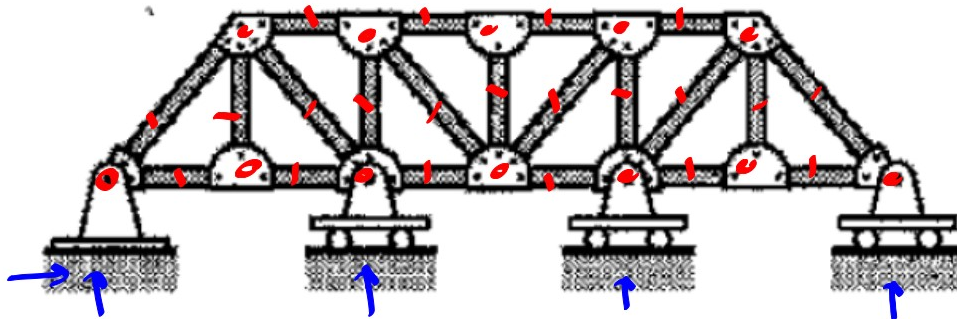
Assort for the beam shown below as statically determinate or statically indeterminate. If statically indeterminate calculate degree of indeterminacy and the number of degrees-of-freedom.



$$\begin{aligned}
 v &> C = 3 && \text{statically indeterminate to 3 degrees,} \\
 b &> 3 && \\
 ID &= 3
 \end{aligned}$$

Example 3

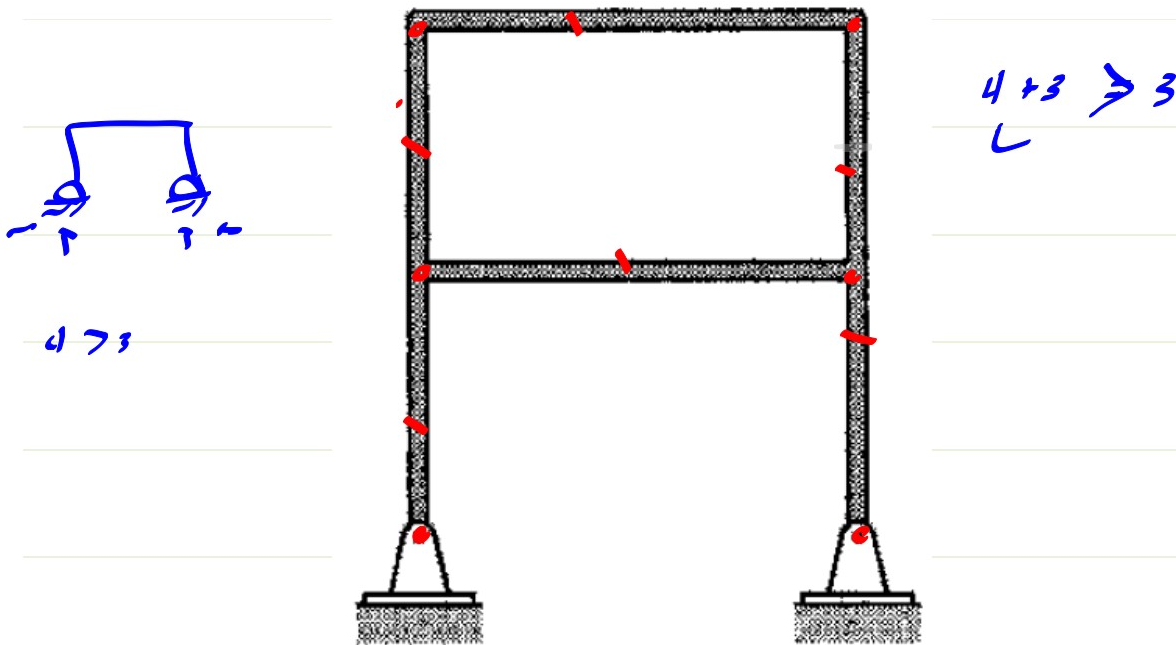
Class of truss described below is statically determinate or statically indeterminate. If it is statically indeterminate, calculate the degree of indeterminacy and the number of degrees of freedom



$$\begin{aligned}
 m + v &= 27 \\
 21 + 5 &= 26 \\
 26 &> 24 && \text{statically indeterminate to 2 degrees} \\
 ID &= 2
 \end{aligned}$$

Example 4

Specify the frame shown below as statically determinate or statically indeterminate. If statically indeterminate calculate degree of indeterminacy and the number of degrees-of-freedom.



$$3m + r > 3J + C$$

$$3 \times 6 + 4 > 3 \times 6 + 0$$

$$22 > 18 \quad \text{statically indeterminate to 4 degree}$$

$$\checkmark \quad \checkmark \quad ID = 4$$