Ministry of Higher Education
Giza Higher Institute for Eng. & Tech.
Civil Engineering Department
Course Name: **Theory of Structures (1)**
Course Code : **CIV 201**

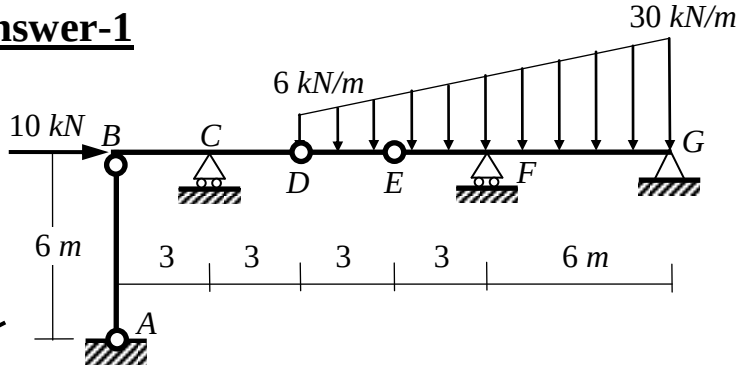
Academic Year : **2015-2016**
Semester : **First**
Level : **Second**
Time : **½ Hours**
Date : **7 / 11 / 2015**
Examiner: ***Dr. M. Abdel-Kader***

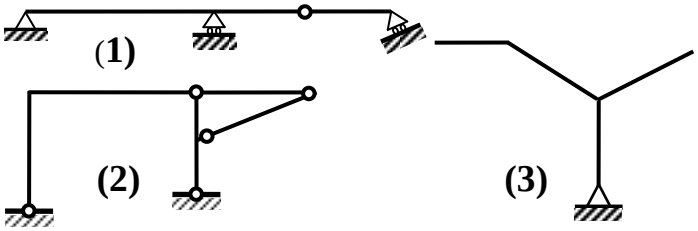
Quiz Answer-1

Question (1): (10 Marks)

(a) For the shown structure, determine the reactions at the supports *A*, *C*, *F* and *G*.

(b) Determine whether each of the shown **3** structures is stable or unstable. If stable, determine whether it is statically determinate or indeterminate.

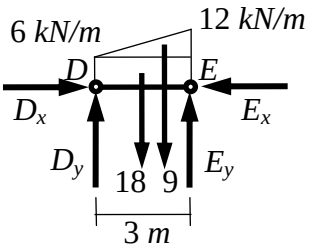




Solution:

(a)

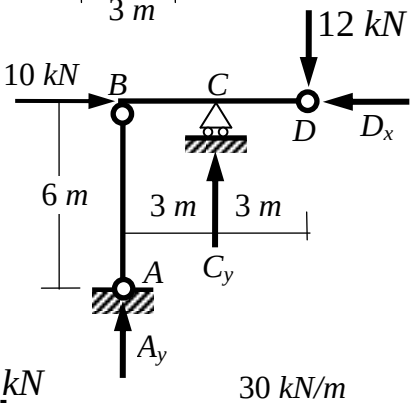
Part *DE*:



$+\circlearrowleft \sum M_D = 0$: $18(1.5) + 9(2) - E_y(3) = 0 \rightarrow E_y = +15 \uparrow$

$+\uparrow \sum F_y = 0$: $D_y + E_y - 18 - 9 = 0 \rightarrow D_y = +12 \uparrow$

Part *ABCD*:

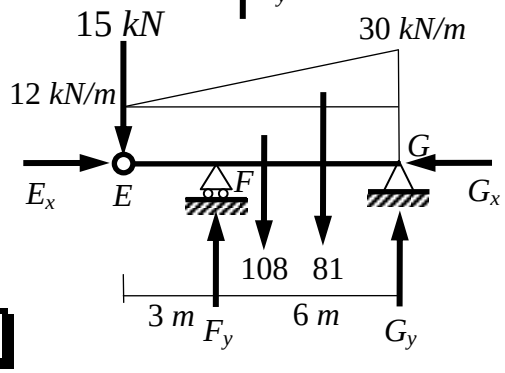


$+\circlearrowleft \sum M_C = 0$: $A_y(6) + 12(3) = 0 \rightarrow A_y = -12 \uparrow$ $\boxed{A_y = 12\ kN \downarrow}$

$+\uparrow \sum F_y = 0$: $A_y + C_y - 12 = 0 \rightarrow C_y = +24 \uparrow$ $\boxed{C_y = 24\ kN \uparrow}$

$+\rightarrow \sum F_x = 0$: $10 - D_x = 0 \rightarrow D_x = +10 \leftarrow$

Part *EFG*:



$+\circlearrowleft \sum M_G = 0$: $-15(9) + F_y(6) - 108(4.5) - 81(3) = 0$

$\rightarrow F_y = +144 \uparrow$ $\boxed{F_y = 144\ kN \uparrow}$

$+\uparrow \sum F_y = 0$: $F_y + G_y - 15 - 108 - 81 = 0$

$\rightarrow G_y = +60 \uparrow$ $\boxed{G_y = 60\ kN \uparrow}$

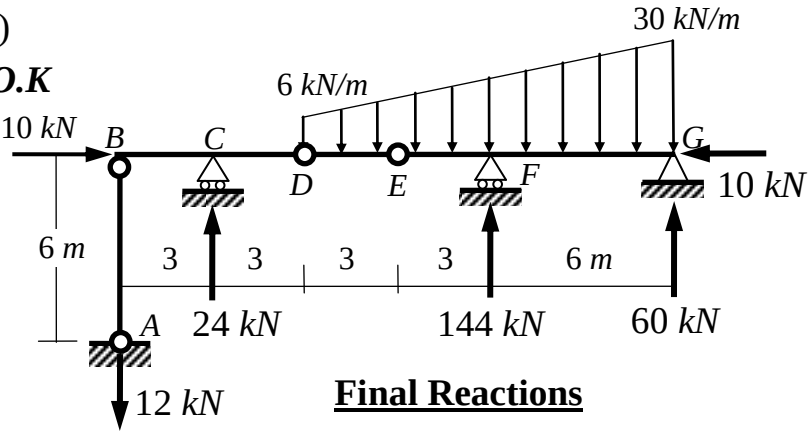
For the entire frame:

$+\rightarrow \sum F_x = 0$: $10 - G_x = 0 \ \therefore G_x = +10 \leftarrow$ $\boxed{G_x = 10\ kN \leftarrow}$

Chech:

$+\uparrow \sum F_y = A_y + C_y + F_y + G_y - 0.5(6+30)(12)$

$= -12 + 24 + 144 + 60 - 216 = 0$ ***O.K***



(b)

(1) Stable + Determinate.
(2) Stable + Determinate.
(3) Unstable.

Final Reactions

Or

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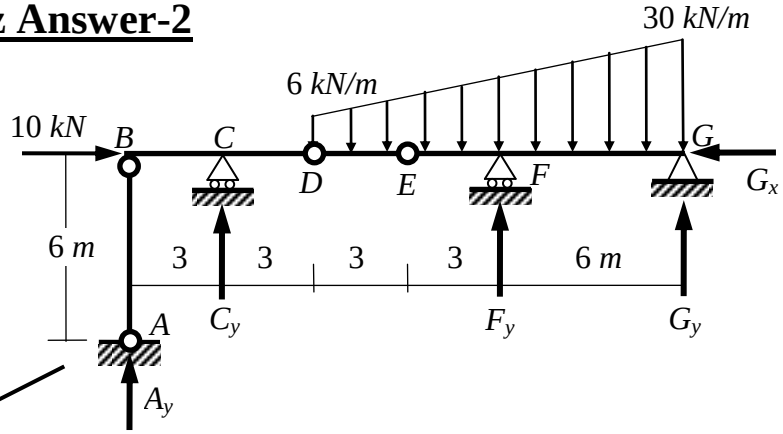
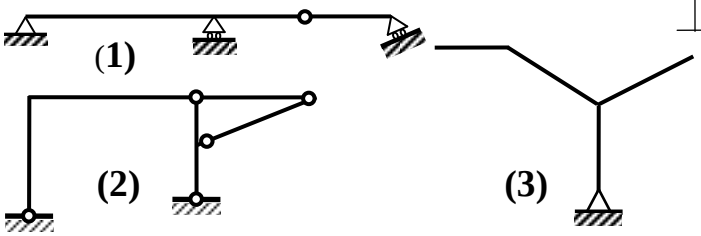
Quiz Answer-2

Question (1): (10 Marks)

(a) For the shown structure, determine the reactions at the supports *A*, *C*, *F* and *G*.

(b) Determine whether each of the shown **3** structures is stable or unstable. If stable, determine whether it is statically determinate or indeterminate.





Solution:

(a)

For the entire frame: $+\rightarrow \sum F_x = 0$: $10 - G_x = 0 \quad \therefore \quad G_x = +10 \leftarrow$ $\boxed{G_x = 10\ kN \leftarrow}$

For Part *AD*: $+\circlearrowleft \sum_{D}^{A} M_D = 0$: $A_y(6) + C_y(3) = 0 \rightarrow 2A_y + C_y = 0$ ….. (1)

For Part *AE*: $+\circlearrowleft \sum_{E}^{A} M_E = 0$: $A_y(9) + C_y(6) - 18(1.5) - 9(1) = 0 \rightarrow 3A_y + 2C_y = 12$ ….. (2)

From (1) and (2): $A_y = -12 \uparrow$ and $C_y = +24 \uparrow$ $\boxed{A_y = 12\ kN \downarrow}$ and $\boxed{C_y = 24\ kN \uparrow}$

For Part *DG*: $+\circlearrowleft \sum_{D}^{G} M_D = 0$: $(6\times12)(6) + (0.5\times24\times12)(8) - F_y(6) + G_y(12) = 0$

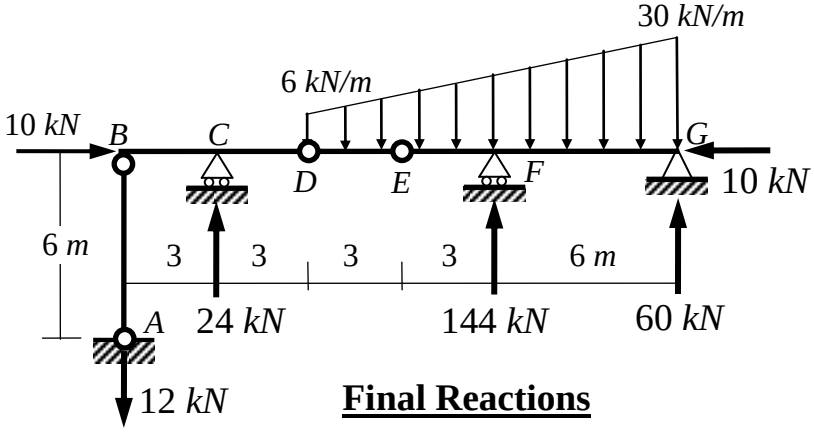
$\rightarrow F_y + 2G_y = 264$ ….. (3)

For Part *EG*: $+\circlearrowleft \sum_{E}^{G} M_E = 0$: $108(4.5) + (81)(6) - F_y(3) - G_y(9) = 0 \rightarrow F_y + 3G_y = 324$ ….. (4)

From (3) and (4): $F_y = +144 \uparrow$ and $G_y = +60 \uparrow$ $\boxed{F_y = 144\ kN \uparrow}$ and $\boxed{G_y = 60\ kN \uparrow}$

Chech:

$+\uparrow \sum F_y = A_y + C_y + F_y + G_y - 0.5(6+30)(12) = -12 + 24 + 144 + 60 - 216 = 0$ ***O.K***



Final Reactions

(b)

(1) Stable + Determinate.
(2) Stable + Determinate.
(3) Unstable.