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

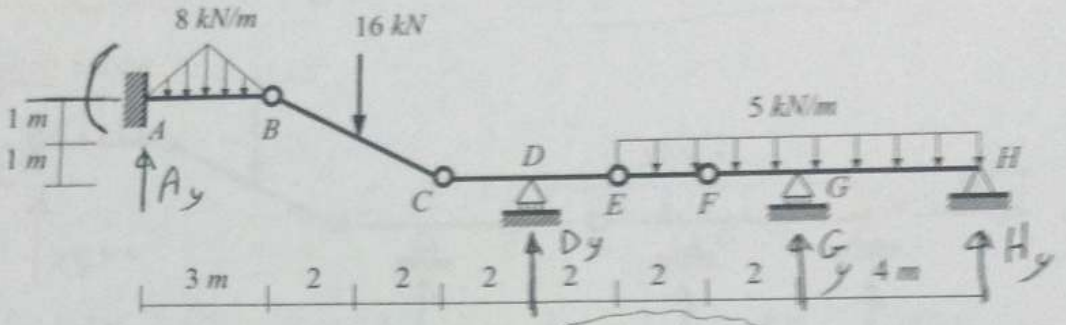
Academic Year : **2014-2015**
Semester : **First**
Level : **2nd**
Time : **1½ Hours**
Date : **25 / 11 / 2014**
Examiner: ***Dr. M. Abdel-Kader***

Mid-Term Exam

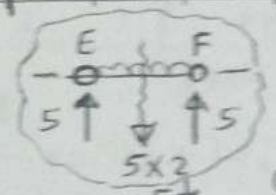
Question (1): (14 Marks)

For the shown beam, determine the reactions at the supports ***A***, ***D***, ***G***, and ***H***.

Note: *In your answer sheet, draw the final reactions (direction and magnitude) on the beam.*



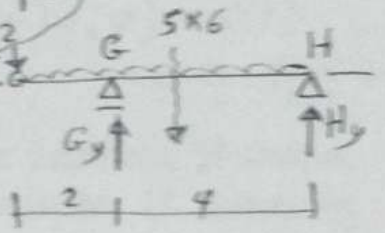
Part EF $E_y = 5\ KN\uparrow$ $F_y = 5\ KN\uparrow$



Part FGH $+\circlearrowleft \Sigma M_G = 0$

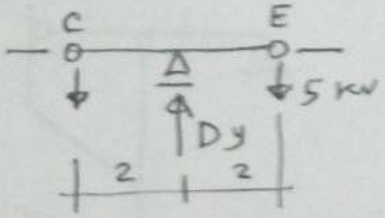
$-5(2) + (5\times6)(1) - H_y(4) = 0$

$\therefore \boxed{H_y = 5\ KN\uparrow}$



$+\uparrow \Sigma F_y = 0$ $\quad -5 + G_y - 5\times6 + 5 = 0 \Rightarrow \boxed{G_y = 30^{KN}\uparrow}$

Part CDE

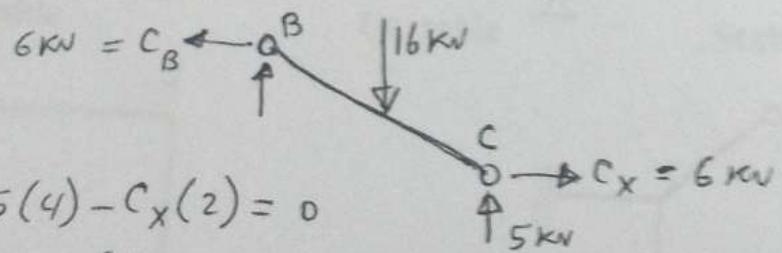


$+\circlearrowleft \Sigma M_C = 0$ $\quad -D_y(2) + 5(4) = 0$

$\therefore \boxed{D_y = 10\ KN\uparrow}$

$+\uparrow \Sigma F_y = 0$ $\quad C_y - 10 - 5 = 0 \Rightarrow C_y = 5\ KN\downarrow$

Part BC



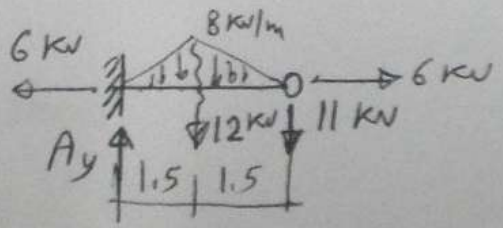
$+\circlearrowleft \Sigma M_B = 0$

$16(2) - 5(4) - C_x(2) = 0$

$\Rightarrow C_x = 6\ KN \rightarrow \Rightarrow C_B = 6\ KN \leftarrow$

$+\uparrow \Sigma F_y = 0 \Rightarrow B_y = 11\ KN\uparrow$

Part AB



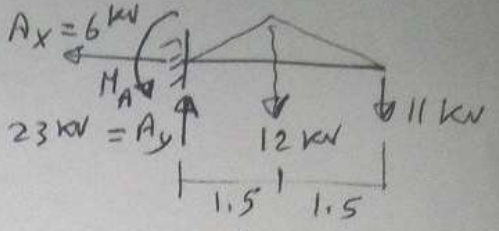
Part AB (Continue)

$+\uparrow \Sigma F_y = 0 \quad A_y - 12 - 11 = 0 \Rightarrow \boxed{A_y = 23\ KN \uparrow}$

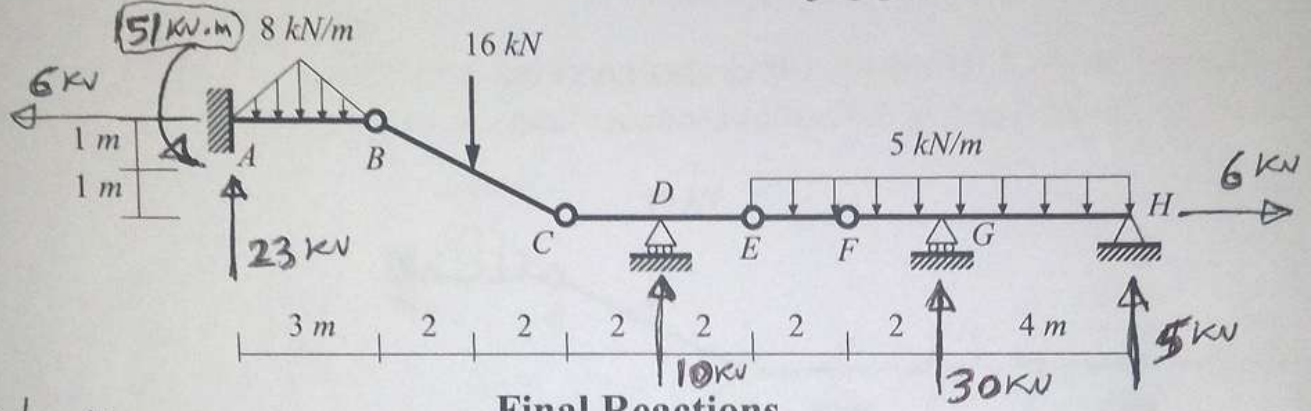
$\pm \rightarrow \Sigma F_x = 0 \Rightarrow \boxed{A_x = 6\ KN \leftarrow}$

$\curvearrowright \Sigma M_A = 0 \quad -M_A + 12(1.5) + 11(3) = 0$

$\therefore \boxed{M_A = 51\ KN.m \curvearrowleft}$



For the entire beam $\Sigma F_x = 0 \Rightarrow \boxed{H_x = 6\ KN \rightarrow}$



Final Reactions

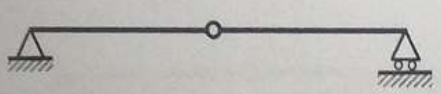
Check:

$\curvearrowright \Sigma M_H = -51 + 23(19) - 16(14) + 10(10) - 40(4) + 30(4) - 6(2) - 12(17.5)$

$= 0$ O.K. ✓

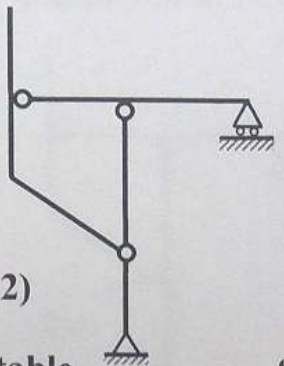
Question (2): (6 Marks)

Determine whether each of the shown structures is stable or unstable. If stable, determine whether it is statically determinate or indeterminate. If statically indeterminate, determine the degree of indeterminacy.



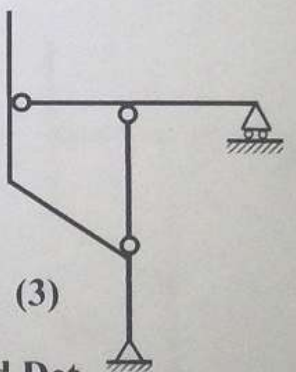
(1)

Unstable



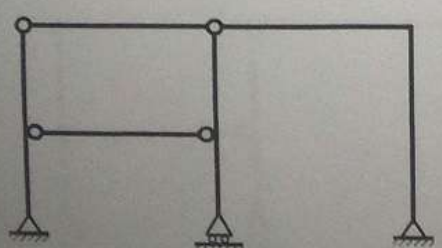
(2)

Unstable



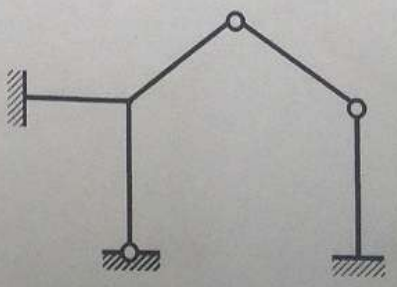
(3)

Stable and Det.



(4)

Stable and Det.



(5)

Statically Indeterminate to the third degree