الأزهر الشريف
قطاع المعاهد الأزهرية

نموذج رقم (١)

نموذج إجابة لامتحان الشهادة الثانوية الأزهرية

للعام الدراسي ١٤٤١هـ - ٢٠١٩ / ٢٠٢٠م

الدور الثاني

القسم : العلمي(نظام حديث)

مادة : الاستاتيكا (مترجم)

عدد الأسئلة (٥)

علما بأن النموذج استرشاديا

Q1 (3 marks)

	Solution	mark
1	16	$\frac{1}{2}$
2	$\mu_s > \mu_k$	$\frac{1}{2}$
3	$25\sqrt{3}$	$\frac{1}{2}$
4	$\frac{1}{2}\cot\theta$	$\frac{1}{2}$
5	-17	$\frac{1}{2}$
6	26	$\frac{1}{2}$

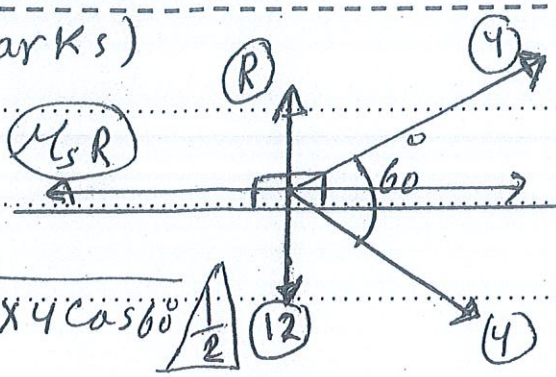
Question (2) [2 marks)

(a) $\because R = 12$ Kg.wt $\frac{1}{2}$

$\because M_S R = \sqrt{(4)^2 + (4)^2 + 2 \times 4 \times 4 \cos 60^\circ}$ $\frac{1}{2}$

$\because 12 M_S = 4\sqrt{3} \quad \therefore M_S = \frac{\sqrt{3}}{3}$ $\frac{1}{2}$

$\therefore M_S = \tan \alpha \quad \because m(\angle \alpha) = 30^\circ$ $\frac{1}{2}$



(b) [2 marks]

The two forces (15, 15) form a couple of magnitude

$M_1 = 15 \times 40 = 600$ gm.wt.cm (F) $\frac{1}{2}$

The two forces (30, 30) form a couple of magnitude $M_2 = -30 \times 30 = -900$ gm.wt.cm $\frac{1}{2}$

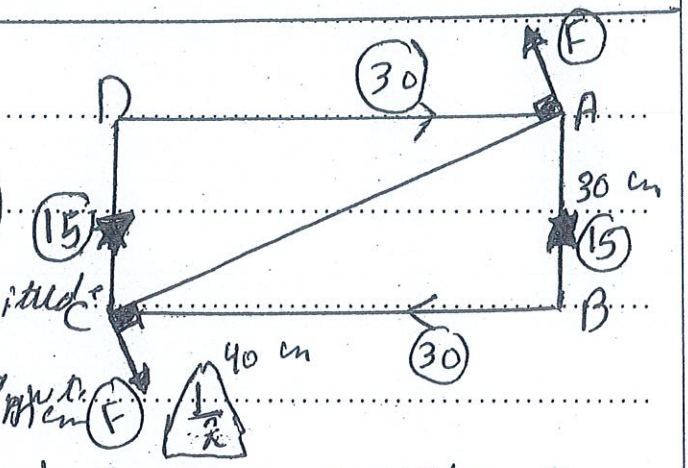
$\therefore M = M_1 + M_2 = -300$ gm.wt.cm

$\therefore$ The system equivalent to a couple of moment $= -300$ gm.wt.cm

$\therefore$ The two forces (F, F) form a couple of moment 300 gm.wt.cm $\frac{1}{2}$

$\therefore F \times 50 = 300 \quad \therefore F = 6$ gm.wt

$\therefore$ The two forces are 6 gm.wt $\Rightarrow$ 6 gm.wt $\frac{1}{2}$



Question (3) [2marks]

(a) $\vec{r} = \vec{BA} = \vec{A} - \vec{B}$

$= (-1, 1, -4)$ ½

$\therefore \vec{M_B} = \vec{R} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1 & 1 & -4 \\ 3 & m & 4 \end{vmatrix}$ 1½

$= (4 + 4m)\hat{i} - (-4 + 12)\hat{j} + (-m - 3)\hat{k}$ ½

$\therefore \vec{M_B} = 12\hat{i} - 8\hat{j} - 5\hat{k}$

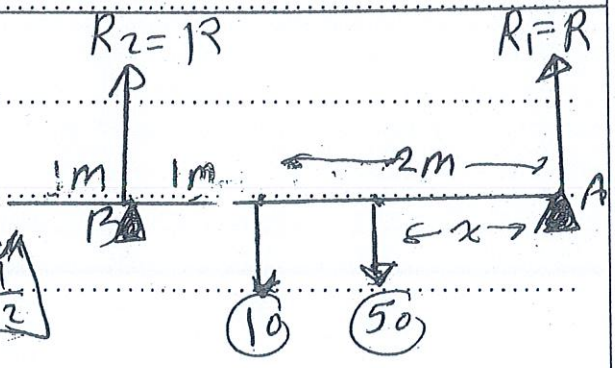
$\therefore 4 + 4m = 12$ $\boxed{m = 2}$ ½

[2 marks]

$R_1 + R_2 = 60$ ½

$\therefore 2R = 60$

$\therefore R = 30$ Kg.wt ½



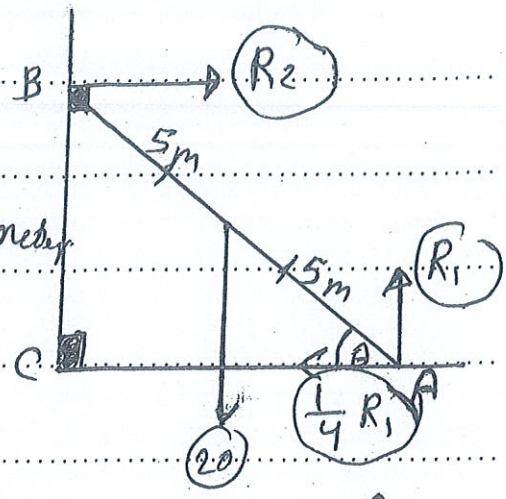
$M_A = Zero$ $\therefore 50x + 10 \times 2 - 30 \times 3 = 0$ ½

$\therefore 50x = 70$

$\therefore x = 1.4$ meter from A ½

[2 marks]

Question (4)



(a) $AC = \sqrt{(10)^2 - (8)^2} = 6$ m

If the ladder is in equilibrium

$\therefore R_2 = \frac{1}{4} R_1$ (1/2)

$\therefore R_1 = 20$ kg.wt $\quad \therefore R_2 = 5$ kg.w (1/2)

$M_A = 20 \times 5 \cos\theta - 5 \times 10 \sin\theta$ (1/2)

$= 20 \times 5 \times \frac{6}{10} - 5 \times 10 \times \frac{8}{10} = 20$ kg.wt.m

$\neq 0$

$\therefore$ The ladder cannot be in equilibrium (1/2)

[2 marks]

(b) $R = 17 - 17 = 0$ (1/2)

$M_A = 7 \times 4 - 11 \times 9 - 6 \times 12 = -143$ Newton.Cm (1/2)

$\therefore R = \text{zero} \Rightarrow M_A \neq \text{zero}$ (1/2)

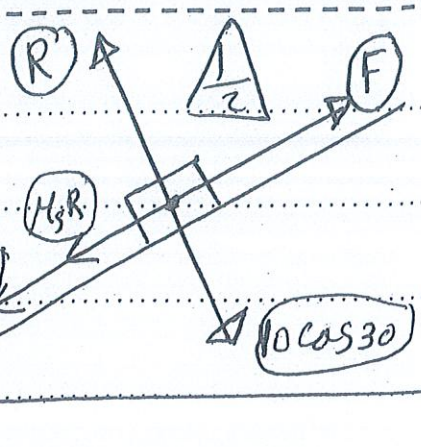
$\therefore$ The system is equivalent to a couple of algebric magnitude equals 143 Newton.Cm (1/2)

[2 marks]

Question (5)

(a) when the body is about to slides

$\therefore \mu_s = \tan 30 = \frac{\sqrt{3}}{3}$ $\frac{1}{2}$



when the body is about to move upwards

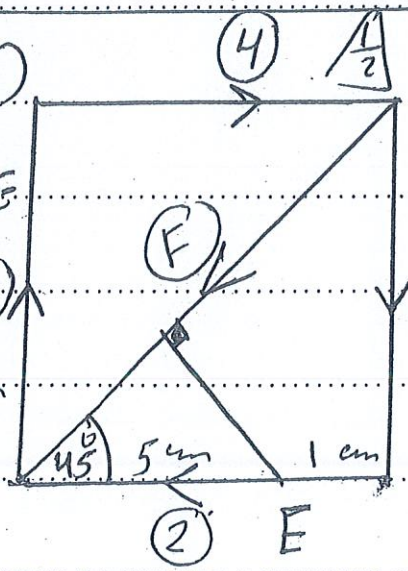
$\therefore F = \mu_s R + 10 \sin 30$ $\frac{1}{2}$

$\therefore F = 10$ Kg.wt $\frac{1}{2}$

[2marks]

(b) The line of action of the resultant passing through the point E

$\therefore M_E = \text{Zero}$ $\frac{1}{2}$



$\therefore -1 \times 1 - 4 \times 6 - 3 \times 5 + F \times 5 \sin 45^\circ = 0$ $\frac{1}{2}$

$\therefore F = 8\sqrt{2}$ Newton $\frac{1}{2}$