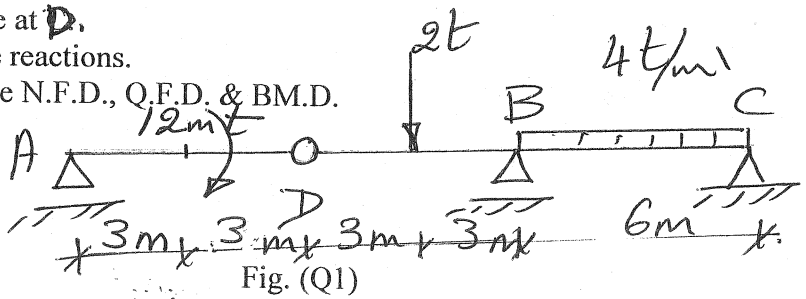
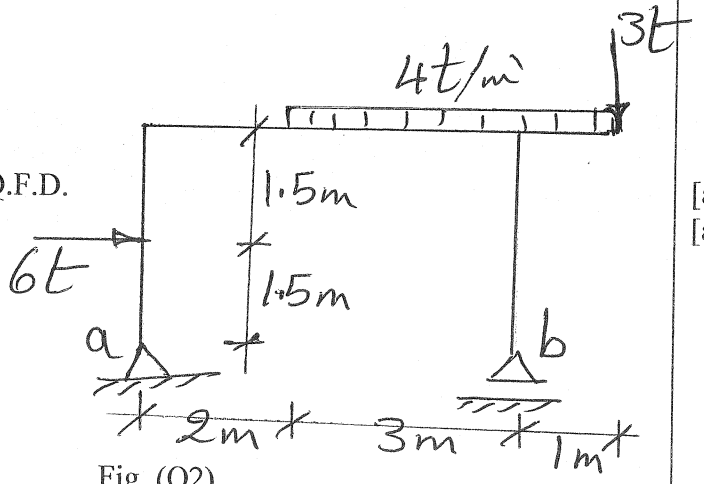
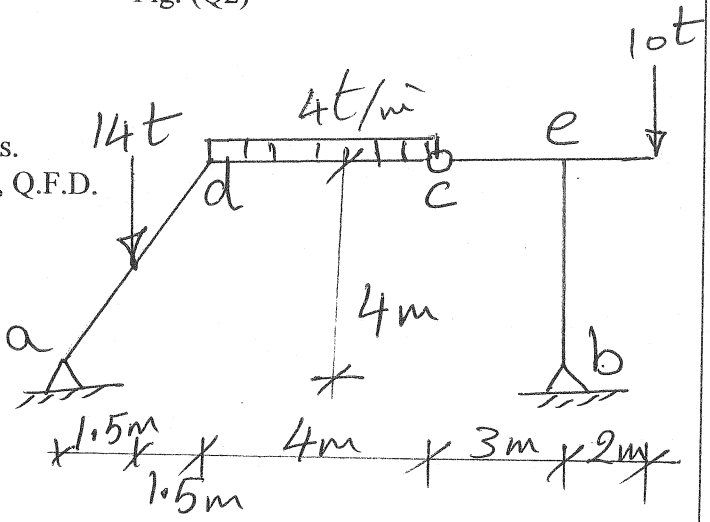
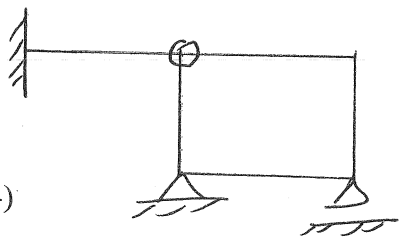
Higher Technological Institute — Civil Eng. Department

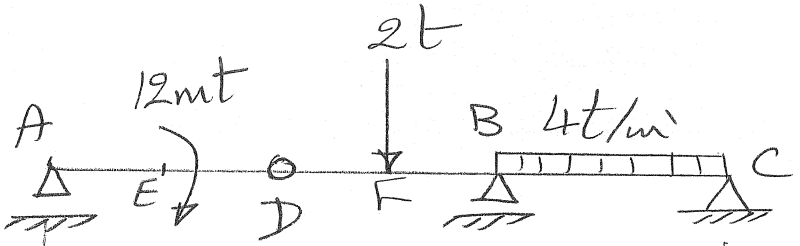
Mid-Term Exam – (Sep-Dec 2017)
Theory of Structures (2)-CT 112

Dr.Manal Kamal Zaki — G 93 — Time: $1\frac{1}{2}$ hrs.

	ILO's	
Q1		
For the shown beam: 1. Separate at D. 2. Find the reactions. 3. Draw the N.F.D., Q.F.D. & BM.D.	[a2] [a2] [a2,b3,c2]	[2 marks] [2 marks] [4 marks]
 Fig. (Q1)		
		[Total 8]
Q2		
For the shown Frame: 1. Find the reactions. 2. Draw the N.F.D., Q.F.D. 3. Draw B.M.D.	[a2] [a2,b3,c2] [a2,b3,c2]	[2 marks] [4 marks] [4 marks]
 Fig. (Q2)		
		[Total 10]
Q3		
For the shown Frame: 4. Find the reactions. 5. Draw the N.F.D., Q.F.D. 6. Draw B.M.D.	[a1] [a2,b3,c2] [a2,b3,c2]	[2 marks] [4 marks] [4 marks]
 Fig. (Q3)		
		[Total 10]
Q4		
Discuss the stability and determinacy of the shown structure:	[b1,c1]	[2 marks]
 Fig. (Q4)		
		[Total 2]
		[Total 30]

Mail:

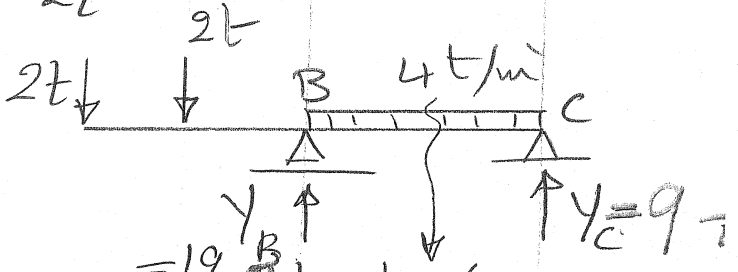
Q1



① $\Sigma M@C = 0$

$2\times12 + 2\times9 + 4\times6\times3 - 6Y_B = 0$

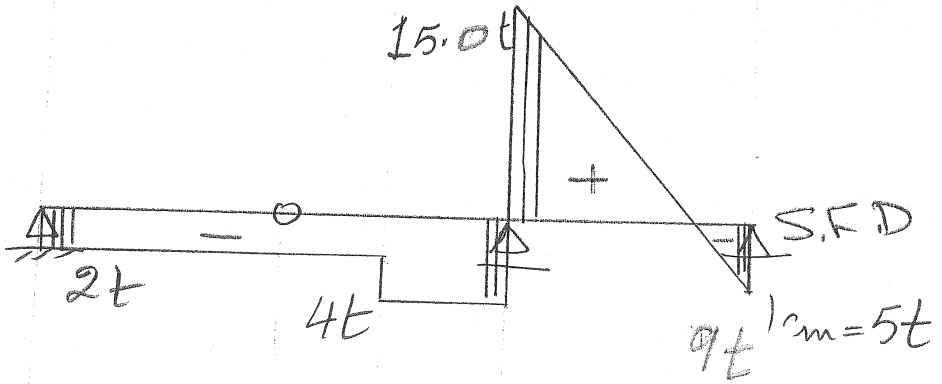
$\therefore Y_B = 19.0\ t$



② $\Sigma F_y = 0$

$2 + 2 + 4\times6 - 19.0 - Y_C = 0$

$\therefore Y_C = 9.0\ t$



$M_E = -2\times3 = -6\ tm$

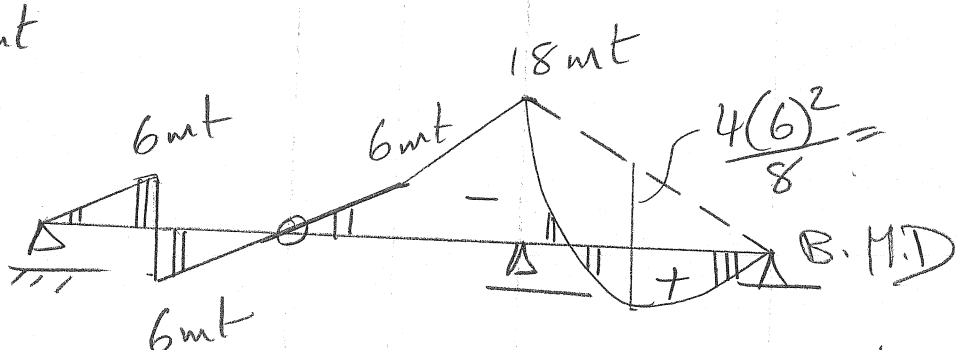
6ft

$M_{ER} = -6 + 12 = +6mt$

$M_F = -2\times3 = -6mt$

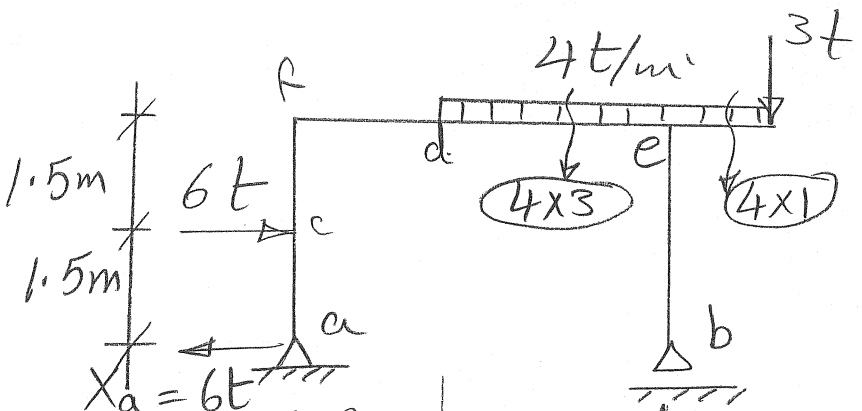
$M_B = -2\times6 - 2\times3$

$= -18mt$



10mt
= 1cm

Q2



$\Phi \Sigma M @ a = 0$

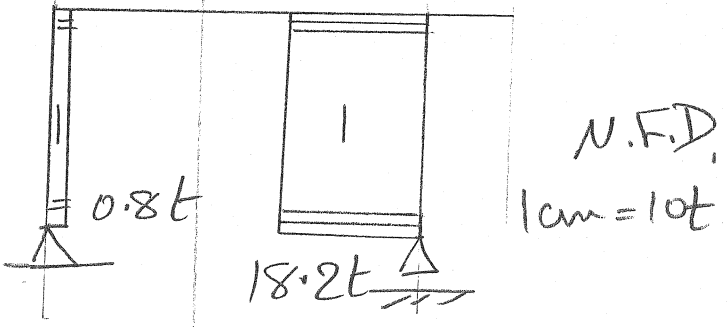
$6 \times 1.5 + 4 \times 4 \times 4 + 3 \times 6 - 5 Y_b = 0$

$\therefore Y_b = 18.2\,t$

$\Sigma F_y = 0$

$\therefore Y_a + 18.2 - 4 \times 4 - 3 = 0$

$\therefore Y_a = 0.8\,t$

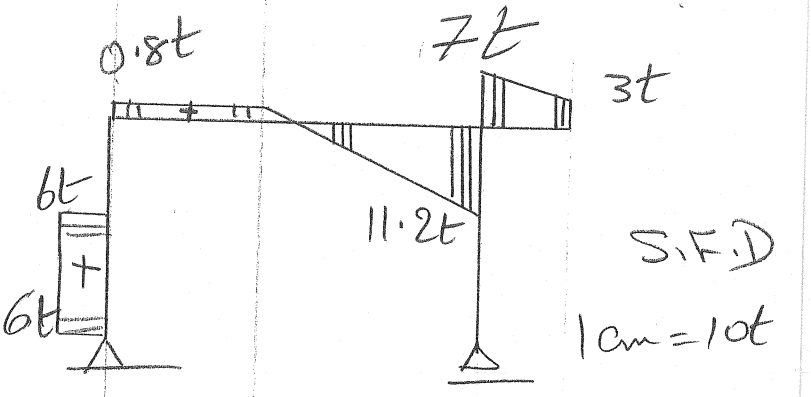


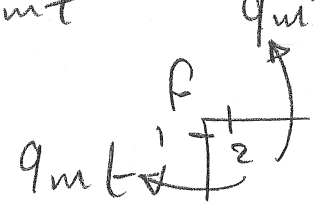
$M_c = 6 \times 1.5 = 9\,mt$

$M_{f_1} = 6 \times 3 - 6 \times 1.5 = 9\,mt$

$M_d = 0.8 \times 2 + 6 \times 3 - 6 \times 1.5$

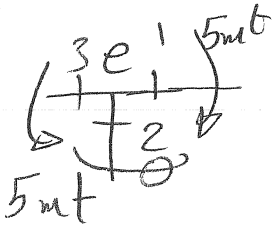
$= 10.6\,mt$

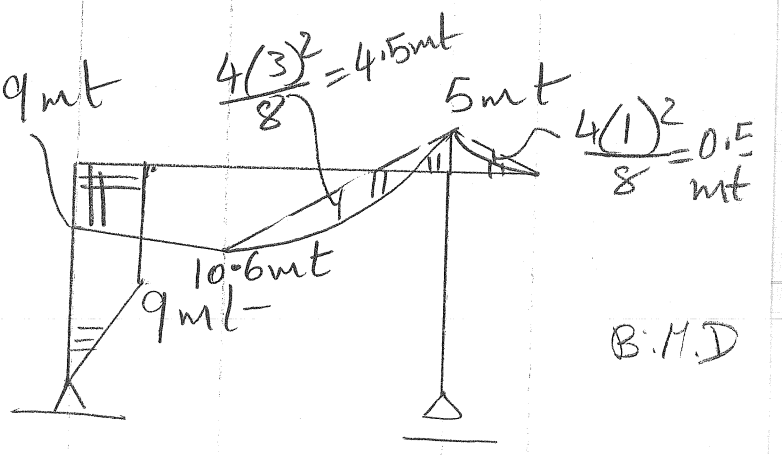




$M_{e_1} = -3 \times 1 - 4 \times 1 \times 0.5$

$M_{e_1} = -5\,mt$



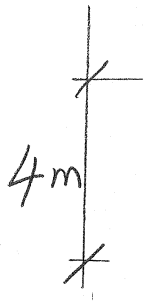


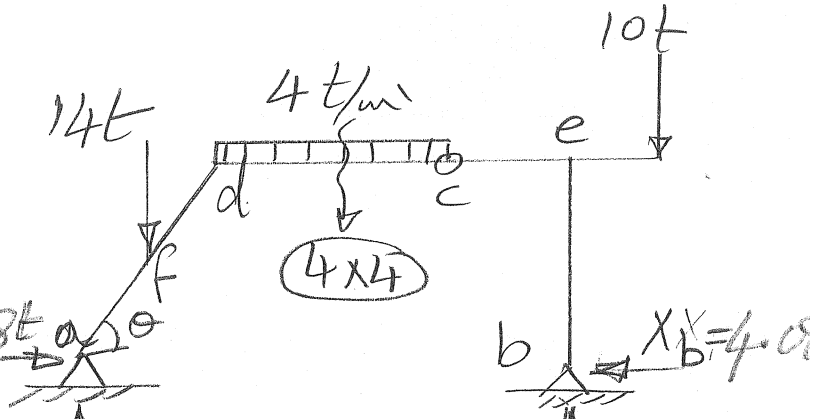
Q3

$\tan\theta = \frac{4}{3}$

$\sin\theta = 0.8$

$\cos\theta = 0.6$





① $\Sigma M_{@a} = 0$

$14 \times 1.5 + 4 \times 4 \times 5 - 10 Y_b + 10 \times 12 = 0$

$\therefore Y_b = 22.1$

② $\Sigma F_y = 0$

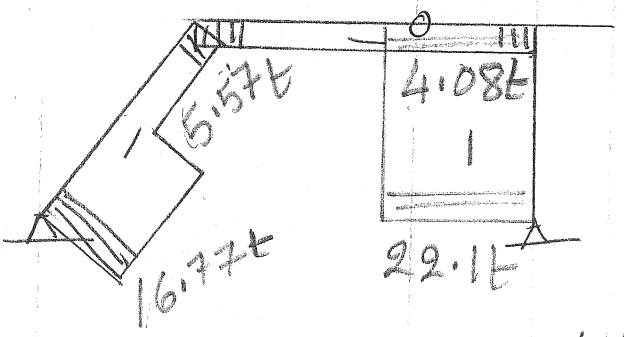
$-14 - 4 \times 4 - 10 + Y_a + Y_b = 0$

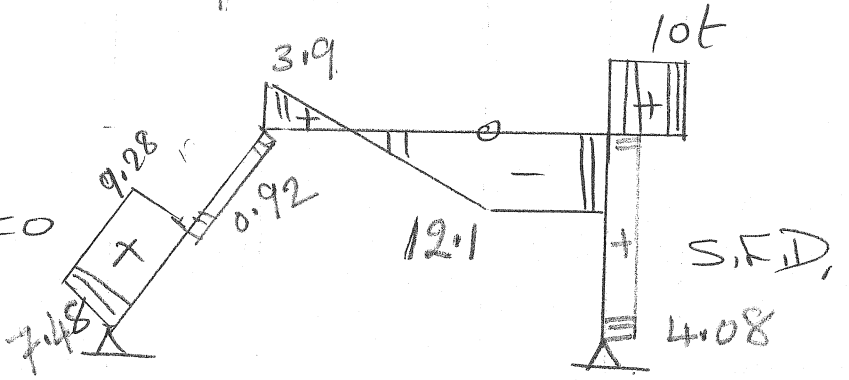
$\therefore Y_a = 17.9t$

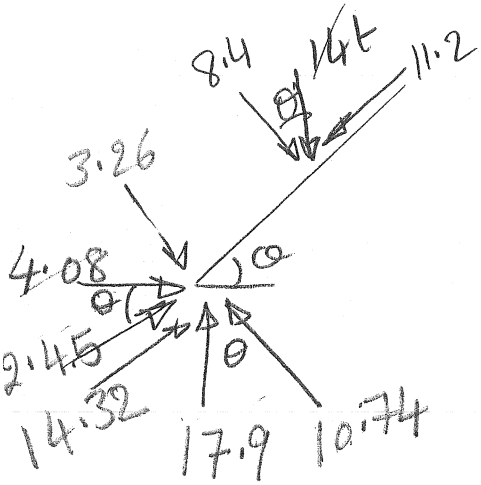
③ $\Sigma M_{cR} = 0$

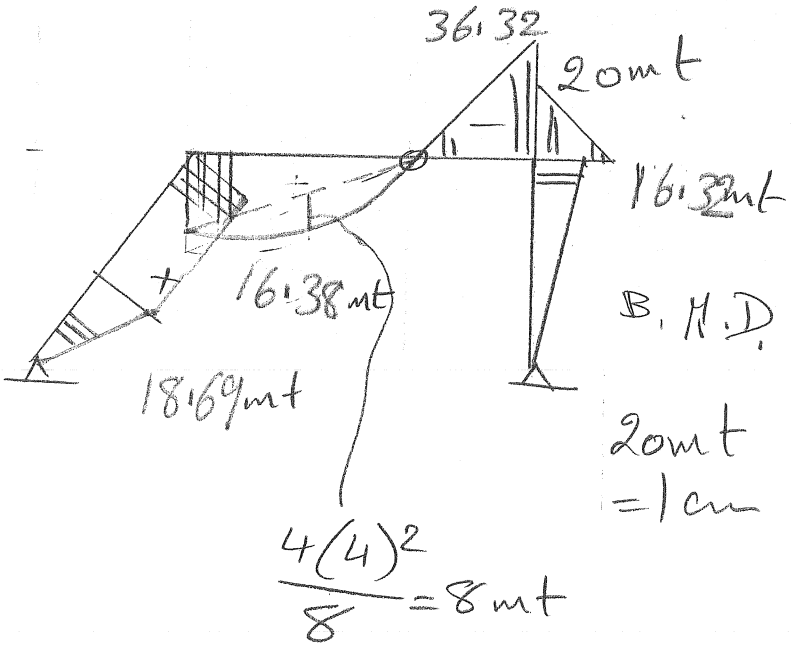
$10 \times 5 + 4 X_b - 22.1 \times 3 = 0$

$\therefore X_b = 4.08$

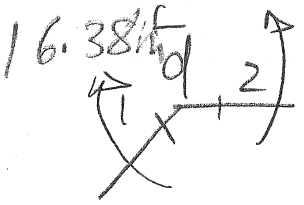




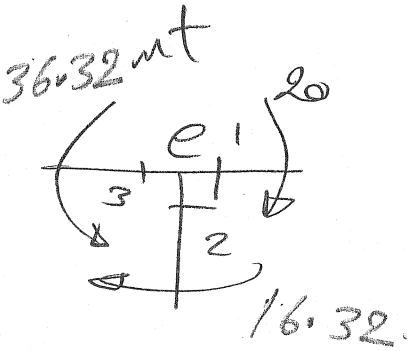




$$M_f = 17.9 \times 1.5 - 4.08 \times 2$$
$$= 18.69 \text{ mt}$$

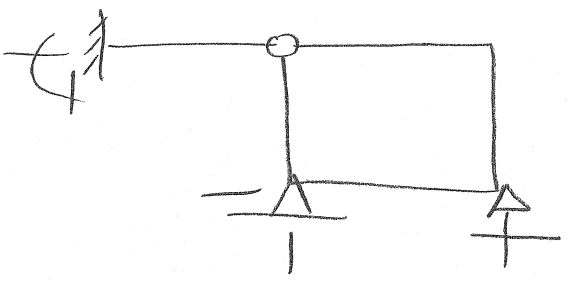


$$M_{e_1} = -10 \times 2 = -20 \text{ mt}$$
$$M_{e_2} = -4.08 \times 4 = -16.32 \text{ mt}$$



$$M_{d_1} = -4.08 \times 4 - 14 \times 1.5 + 17.9 \times 3$$
$$= 16.38 \text{ mt}$$

Q4



$$U = 6 + 3 = 9$$

$$E = 3 + (3-1) = 5$$

∴ Stable & 4 times st. indet.

Higher Technological Institute
10th Ramadan City
(6th October Branch)
Department of Civil Engineering

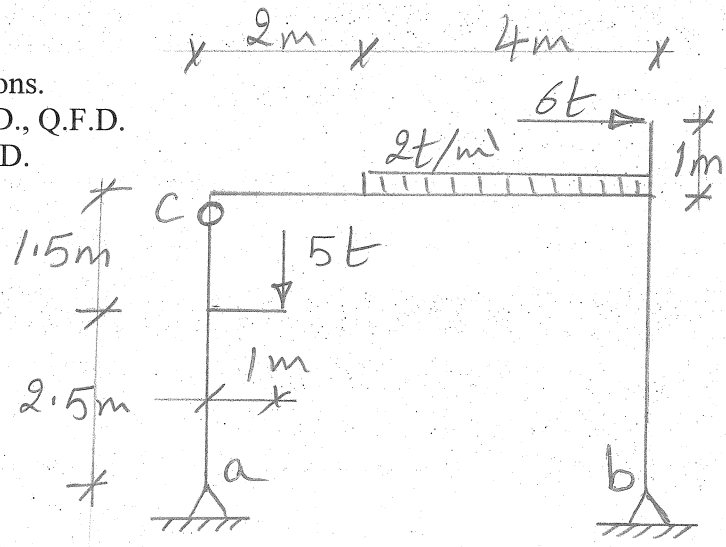
Course :Theory of Structures(2) (CT 112) **Term : Sept.-Oct. 2017-2018**
Examiner: Dr.Manal Kamal Zaki **Time : 90 min**

Final exam

Question 1 {16 Marks} — ILO's

For the shown frame:

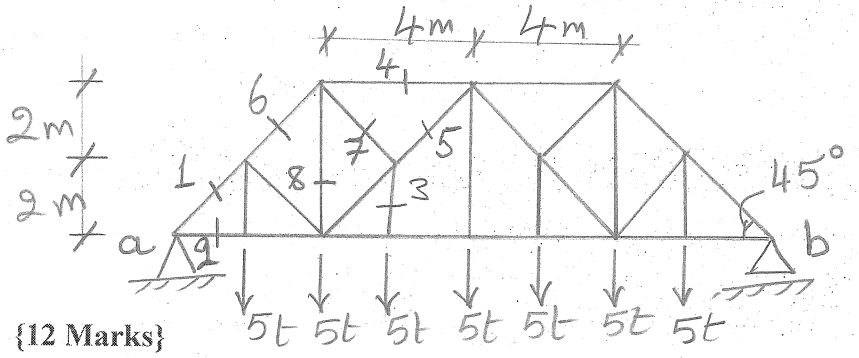
1. Find the reactions. [a2] [4 marks]
2. Draw the N.F.D., Q.F.D. [a2,b3,c2] [8 marks]
3. Draw the B.M.D. [a2,b3,c2] [4 marks]



Question 2 {12 Marks}

For the shown truss:

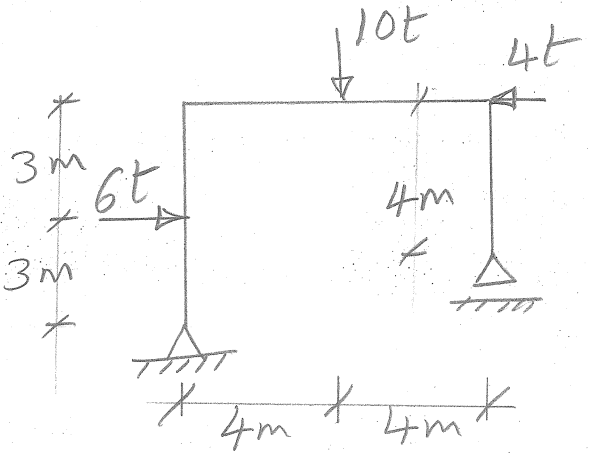
1. Find the reactions. [a2] [2 marks]
2. Find the normal forces in the other marked members. [a3,b3,c3] [8 marks]

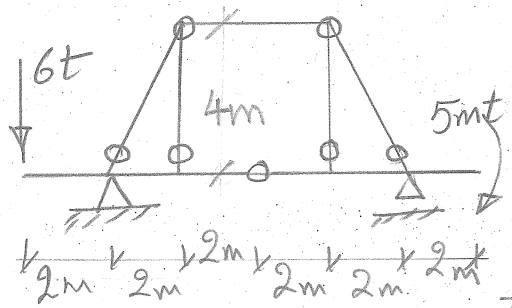


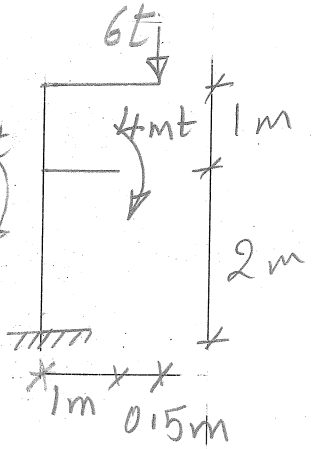
Question 3 {12 Marks}

For the shown structures:

1. Find the forces in the link members. [a2,a4,c4] [12 marks]
2. And draw the B.M.D. only.

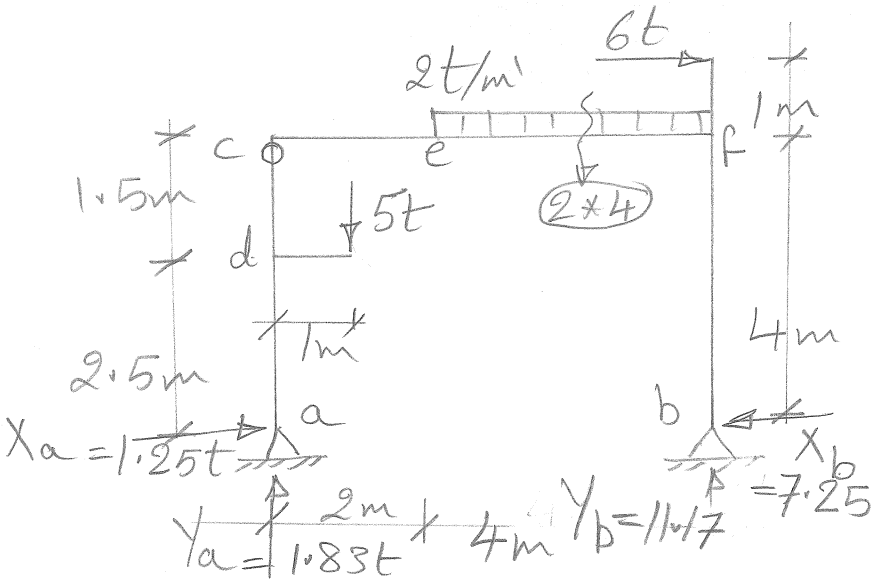






Examination committee: 1-Name Dr. Manal Zaki Signature
2-Name Ahmed A-elazis Signature

Q1



$\Sigma M@c$ 6ft $=0$

$\therefore 5*1 - 4Xa = 0$

$\therefore \boxed{Xa = 1.25t}$

$\Sigma F_x = 0$

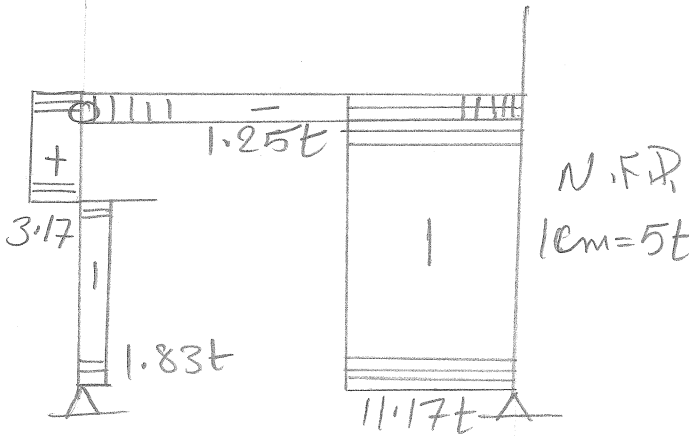
$\therefore Xb - 6 - 1.25 = 0$

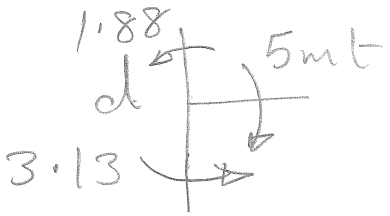
$\therefore \boxed{Xb = 7.25t}$

$\Sigma M@a = 0$

$\therefore 5x1 + 2x4x4 + 6*5 - 6Yb = 0$

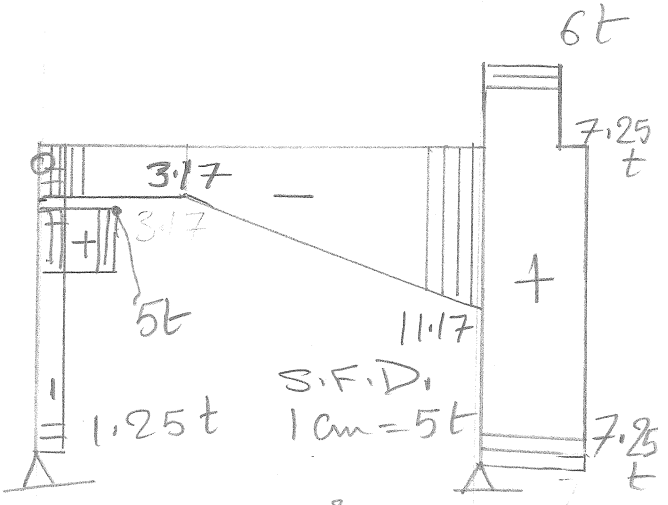
$\therefore \boxed{Yb = 11.17t}$

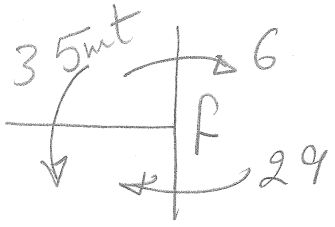


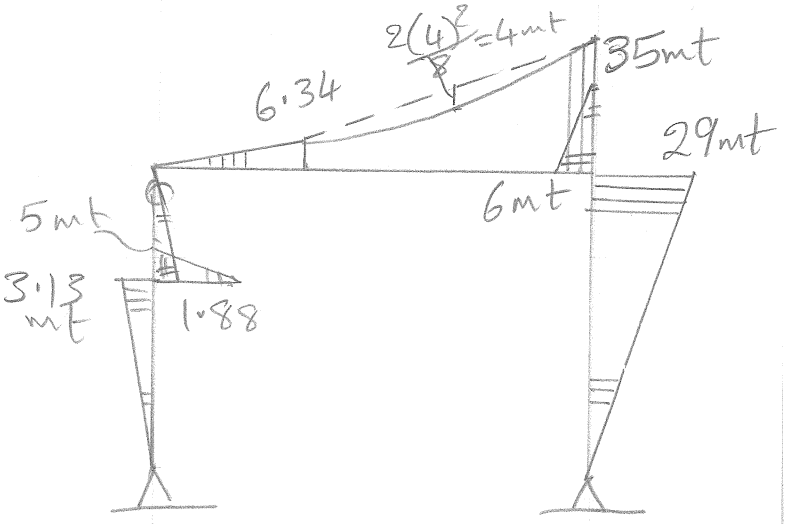


$Me = 1.83*2 - 1.25*4 - 5*1$

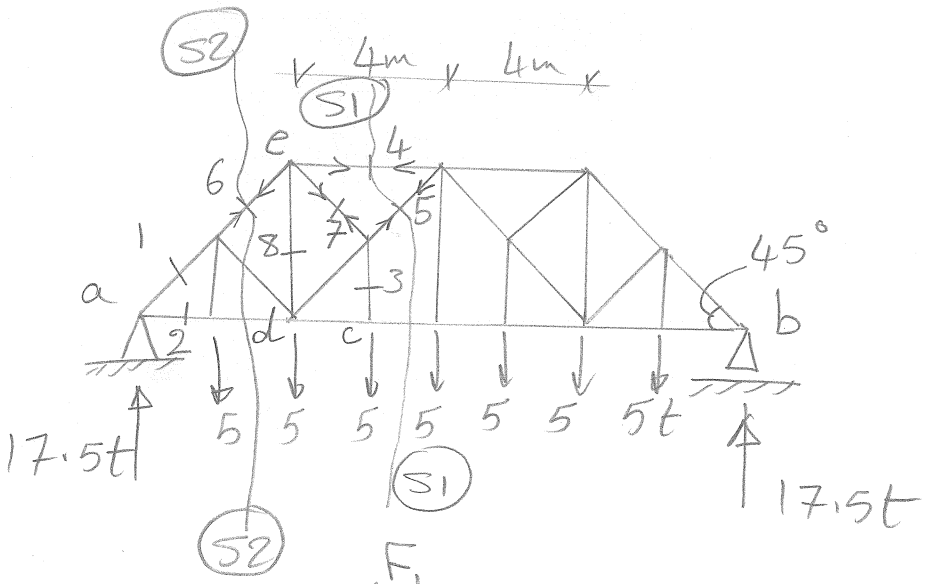
$= -6.34$ mt



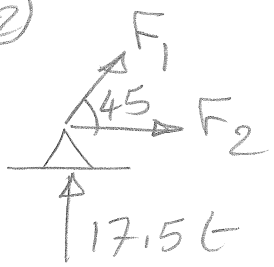




Q 2



Joint a



$\Sigma F_y = 0$

$\therefore 17.5 + F_1 \sin 45 = 0$

$\therefore \boxed{F_1 = -24.75\ t}$ comp.

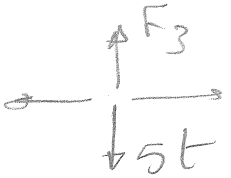
$\Sigma F_x = 0$

$\therefore F_2 + F_1 \cos 45 = 0$

$\therefore \boxed{F_2 = +17.5t}$ tens.

Joint c

$\boxed{F_3 = +5t}$ tens.



Section S1-S1

① $\Sigma M @ d_{left} = 0$

$17.5 \times 4 + 4F_4 + 5 \times 2 - 5 \times 2 = 0$

$\therefore \boxed{F_4 = -17.5t}$ comp

② $\Sigma F_{y_{left}} = 0$

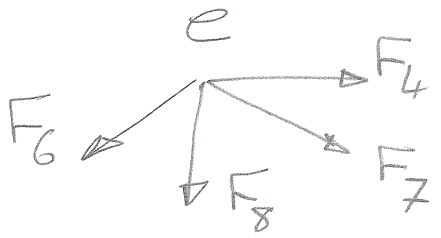
$\therefore 17.5 - 3 \times 5 + F_5 \cos 45 = 0 \therefore \boxed{F_5 = -3.54t}$ comp

Section S2-S2

$\Sigma M @ d\ left = 0$

$17.5 \times 4 - 5 \times 2 + F_6 * 2\sqrt{2} = 0 \therefore \boxed{F_6 = -21.21t}$ comp

Joint e:



① $\Sigma F_x = 0$

$\therefore -F_6 \sin 45 + F_4 + F_7 \cos 45 = 0$

$\therefore -(-21.21)\sin 45 + (-17.5) + F_7 \cos 45 = 0$

$\therefore \boxed{F_7 = +3.54\ t}$ tens.

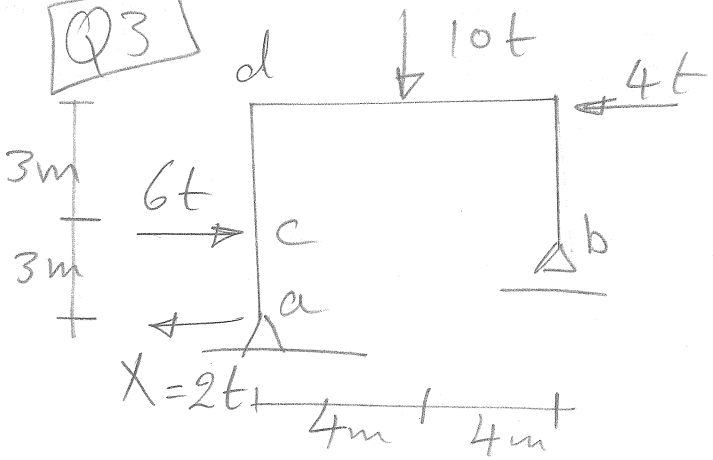
② $\Sigma F_y = 0$

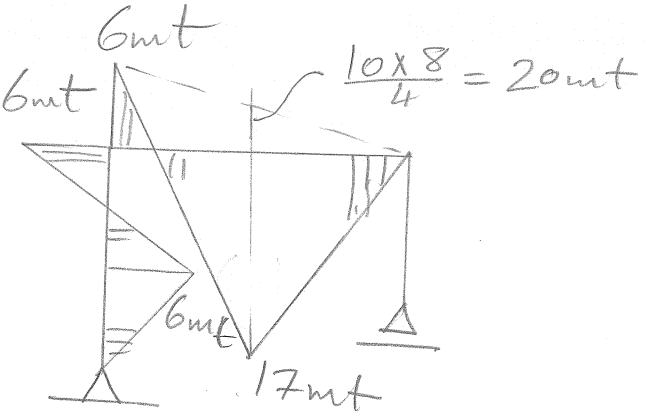
$\therefore F_8 + F_7 \sin 45 + F_6 \sin 45 = 0$

$\therefore F_8 + 3.54 \sin 45 - 21.21 \sin 45 = 0$

$\therefore \boxed{F_8 = +12.50\ t}$

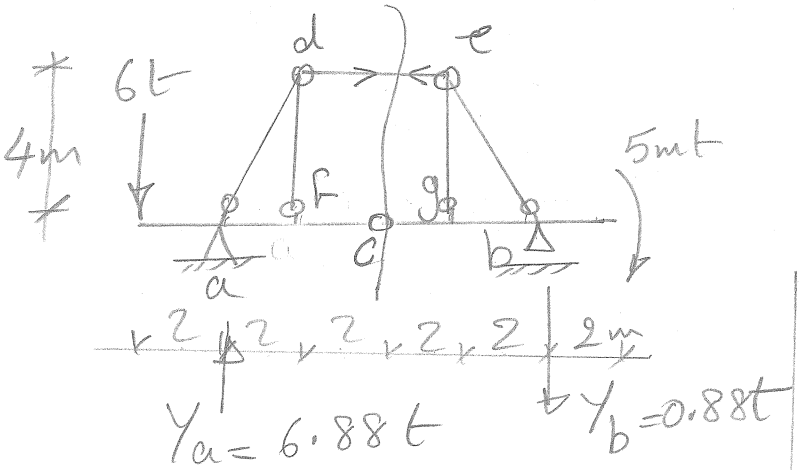
Q3





$M_d = 2 \times 6 - 6 \times 3$

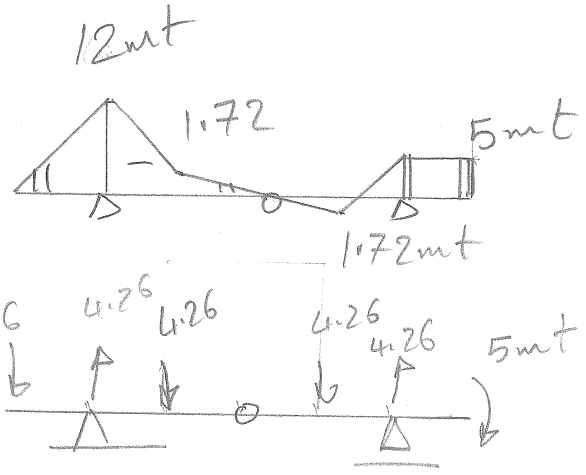
$= -6 \text{ mt}$



$\Sigma M @ b = 0$

$6 \times 10 - 8 Y_a - 5 = 0$

$\therefore Y_a = 6.88 t$



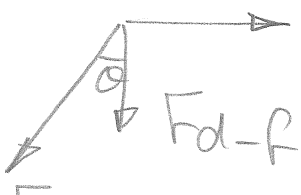
$\Sigma M @ \text{Left} = 0$

$6 \times 6 - 6.88 \times 4 - F_{d-e} \times 4 = 0$

$\therefore F_{d-e} = 2.125 t$ tens.

Joint d

$\tan\theta = \frac{1}{2}$



$M_f = -6 * 4 + 4.26 \times 2 + 6.88 \times 2$

$= -1.72$

$M_g = -5 + 4.26 \times 2 - 0.88 \times 2 =$

$= +1.76$

① $\Sigma F_x = 0$

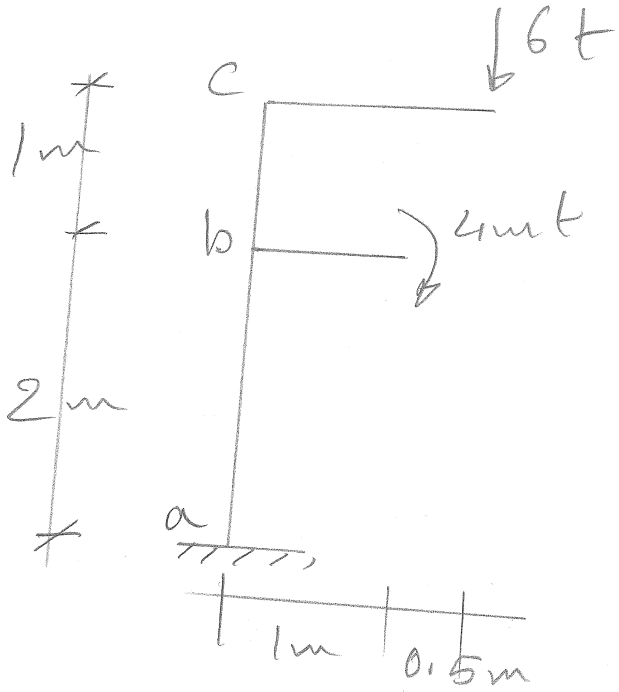
$\therefore F_{d-a} \sin\theta - 2.125 = 0$

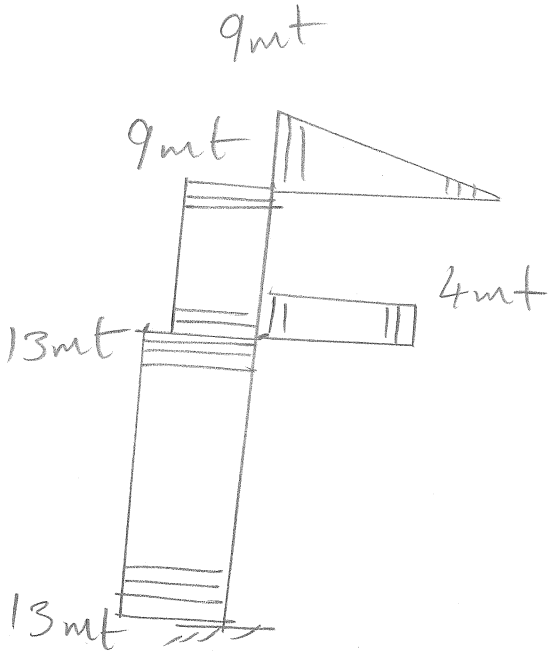
$\therefore F_{d-a} = 4.76 t$

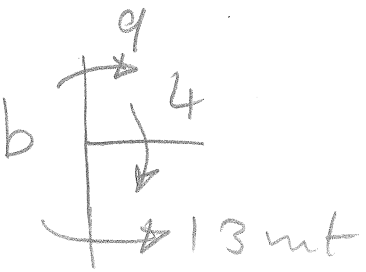
② $\Sigma F_y = 0$

$\therefore F_{d-f} + F_{d-a} \cos\theta = 0$

$\therefore F_{d-f} = -4.26 t$


c
6 t
1m
b
4mt
2m
a
1m
0.5m


9mt
9mt
4mt
13mt
13mt


q
4
b
13mt

Higher Technological Institute

Civil Eng. Department

Dr.Manal Kamal Zaki

Final Exam -(Jan –May 2017)
Theory of Structures (2)
CT 112

Time: $1\frac{1}{2}$ hrs.

ILO's

Q1

For the shown frame:

1. Find the reactions. [a2,d1] [3 marks]
2. Draw the N.F.D., Q.F.D. [a2] [8 marks]
3. Draw the B.M.D. [a2,c1] [5 marks]

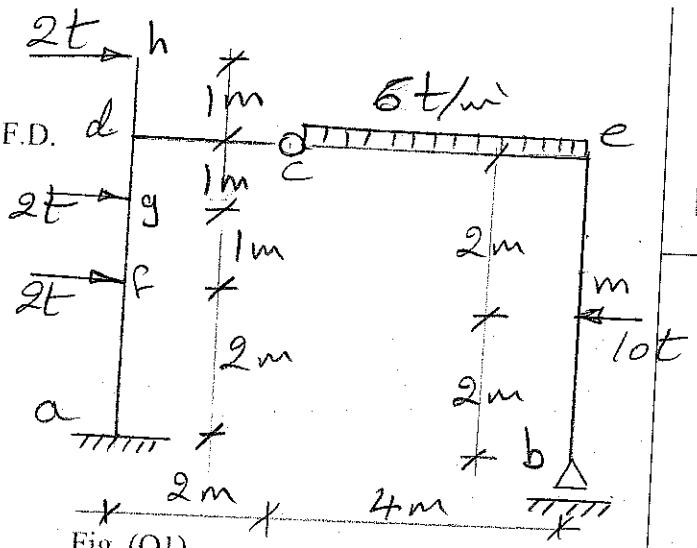


Fig. (Q1)

[Total 16]

Q2

For the shown truss:

1. Find the reactions. [a2] [2 marks]
2. Find the normal forces in the marked members. [a2,c1] [10 marks]

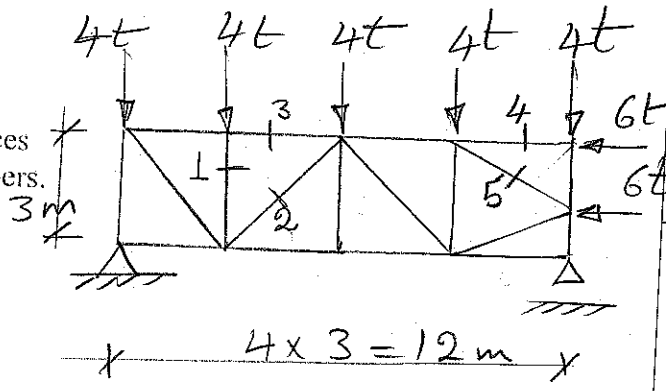


Fig. (Q2)

[Total 12]

Q3

For the shown structures:

1. Find the forces in the link members. a2,c1,d1 [12 marks]
2. And draw the B.M.D. only.

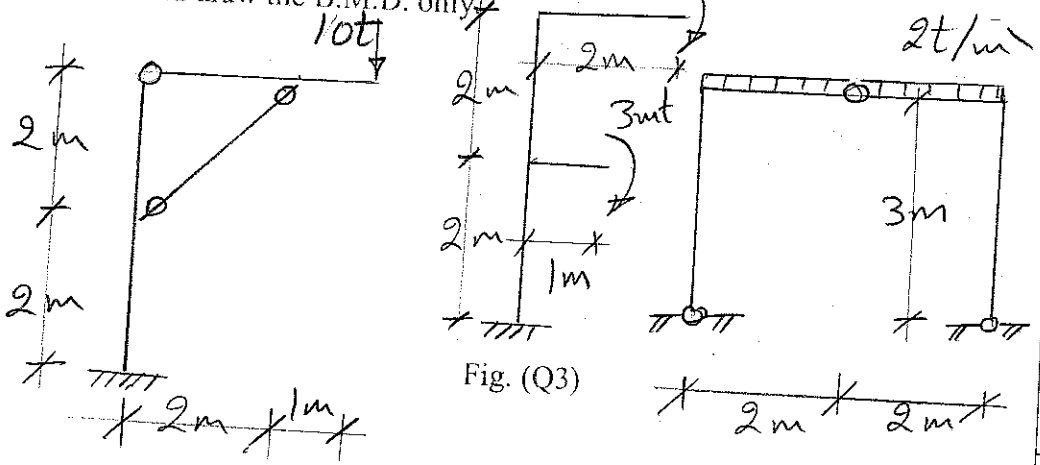
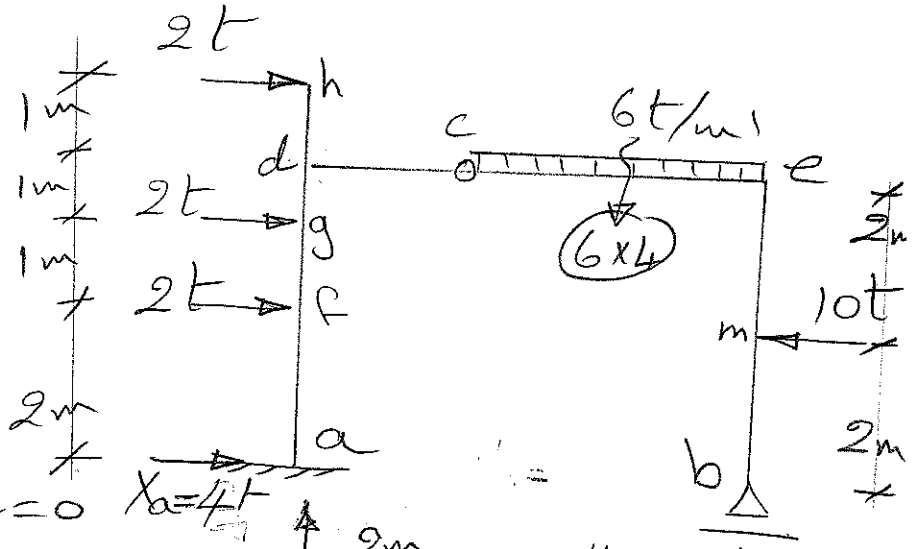


Fig. (Q3)

[Total 12]

Mail:

Q1



① $\Sigma M@c_{right} = 0$

$6\times4\times2 + 10\times2 - Y_b\times4 = 0$

$\therefore Y_b = 17t$

② $\Sigma F_y = 0$

$Y_a + 17 - 6\times4 = 0$

$\therefore Y_a = 7t$

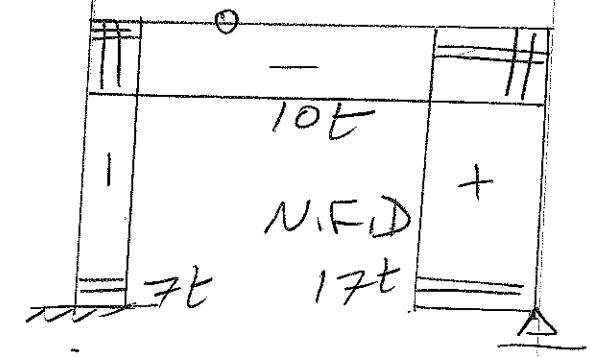
③ $\Sigma F_x = 0 \longrightarrow X_a = 4t$

④ $\Sigma M@c_{left} = 0$

$7\times2 + M_a - 4\times4$

$-2\times2 - 2\times1 + 2\times1 = 0$

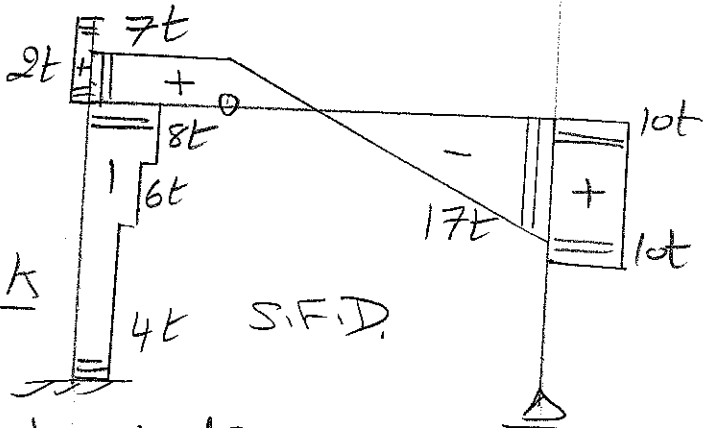
$M_a = 6mt$



check $\Sigma M@b = 0$

$10\times2 + 6\times4\times2 - 7\times6 - 6$

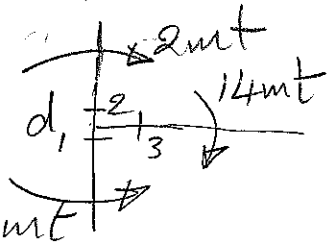
$-2\times2 - 2\times3 - 2\times5 = 0$ o.k

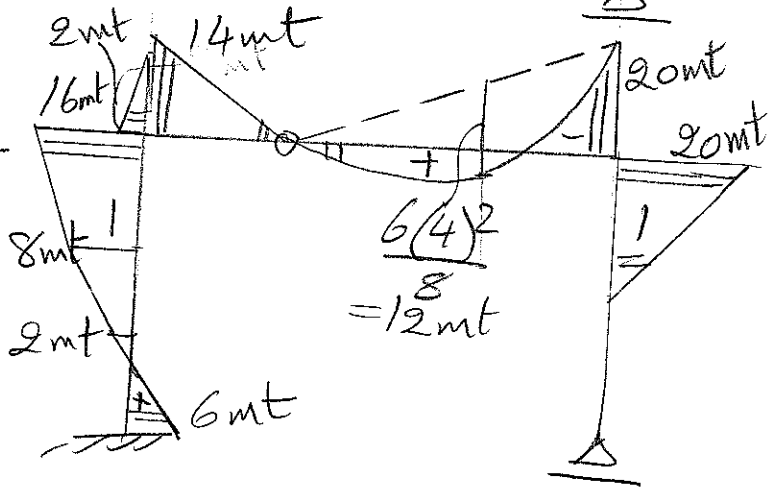


$M_f = 6 - 4\times2 = -2tm$

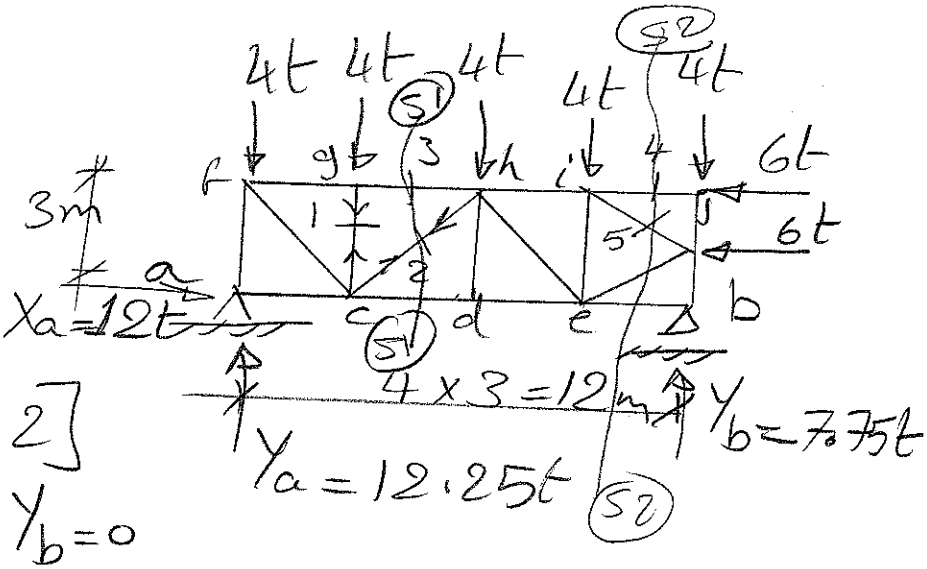
$M_g = 6 - 4\times3 - 2\times1 = -8mt$

$M_{d_1} = 6 - 4\times4 - 2\times2 - 2\times1 = -16mt$





Q2



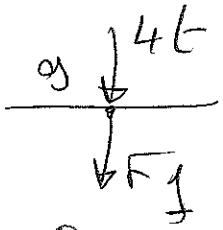
$\Sigma M@a=0$

$\therefore 4\times[3+6+9+12] - 6[1.5+3] - 12Y_b = 0$

$\therefore Y_b = 7.75t$

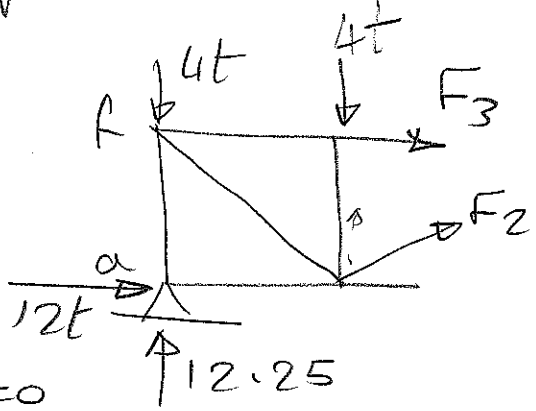
$\therefore Y_a = 12.25t$

Joint g



$\therefore \boxed{F_1 = -4t}$ comp

Section S1-S1



$\Sigma F_{y\,left} = 0$

$\therefore 12.25 - 4 - 4 + F_2\cos 45 = 0$

$\therefore \boxed{F_2 = -6.01t}$ comp.

$\Sigma M@c\,left = 0$

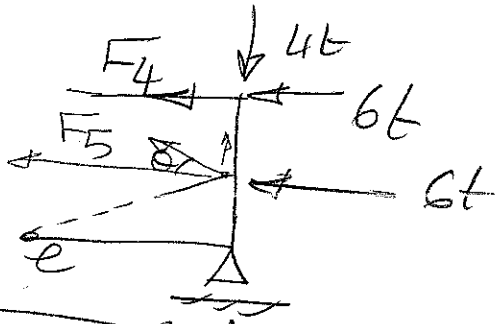
$(12.25-4)\times 3 + 3F_3 = 0$

$\therefore \boxed{F_3 = -8.25t}$ comp

Joint i $\quad \Sigma F_x = 0$

$\therefore \boxed{F_4 = -6t}$ comp

Section S2-S2 $\Sigma M@e=0$

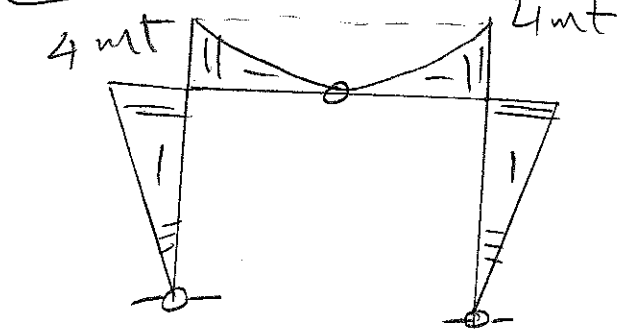


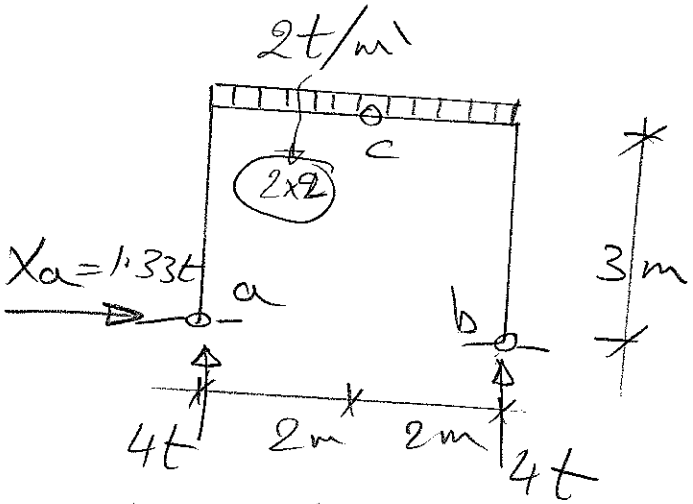
$3F_4 + 1.5F_5\cos\theta + 3F_5\sin\theta + 6\times 1.5 + 6\times 3 - 4\times 3 + 7.75\times 3 = 0$

$20.25 + 2.68F_5 = 0$

$\therefore \boxed{F_5 = -7.55t}$

Q3

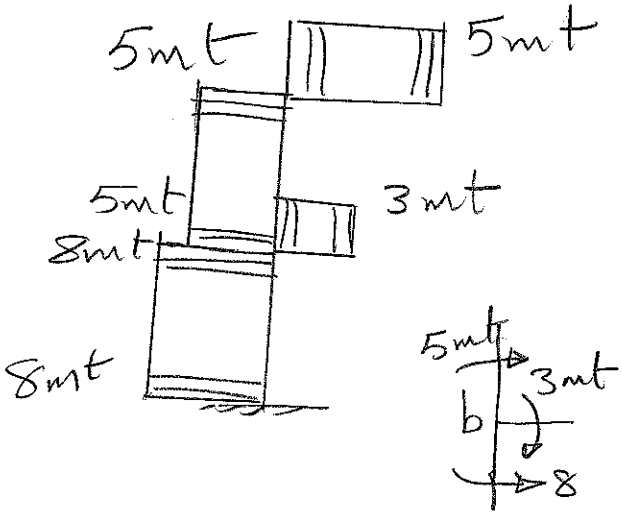


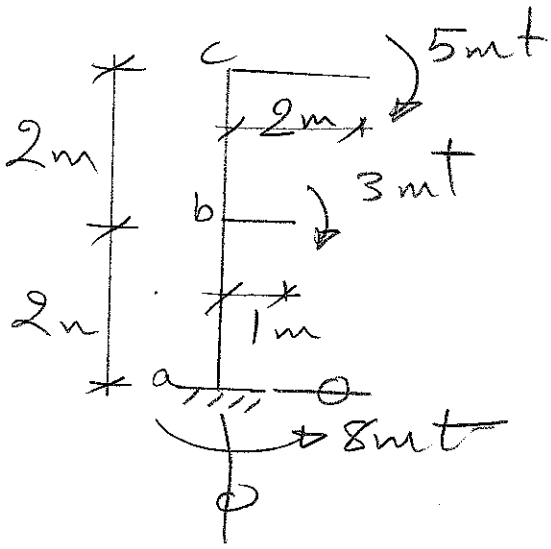


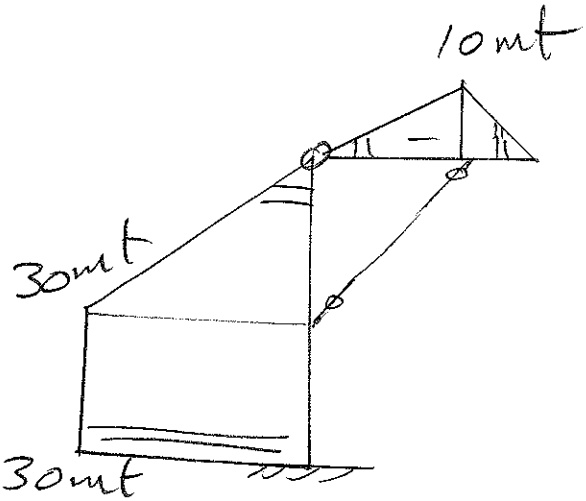
$\Sigma M @ c_{right} = 0$

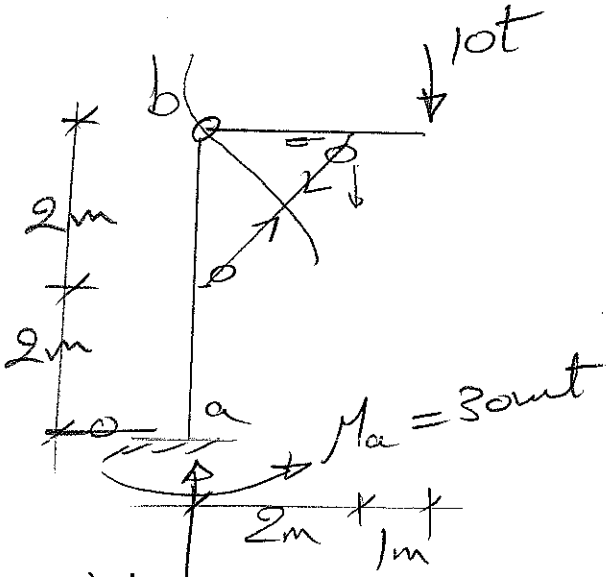
$\therefore 2 \times 2 \times 1 + 3X_a - 4 \times 2 = 0$

$\therefore X_a = 1.33t$









$\Sigma M @ b_{right} = 0$

$10 \times 3 + F\cos 45 \times 2 = 0$

$\therefore \boxed{F = -21.2t}$ comp. $Y_a = 10t$

Higher Technological Institute — Civil Eng. Department

Mid-Term Exam – (Jan-May 2017)

Dr.Manal Kamal Zaki — Theory of Structures (2)-CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1

For the shown beam:

1. Separate at C.
2. Find the reactions.
3. Draw the N.F.D., Q.F.D. & BM.D.

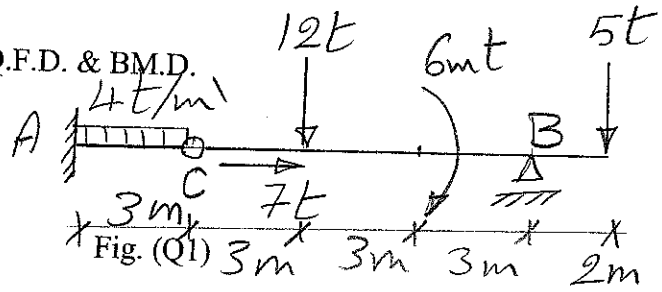


Fig. (Q1)

ILO's	
[a2]	[2 marks]
[a2]	[2 marks]
[a2]	[4 marks]

[Total 8]

Q2

For the shown Frame:

1. Find the reactions.
2. Draw the N.F.D., Q.F.D.
3. Draw B.M.D.

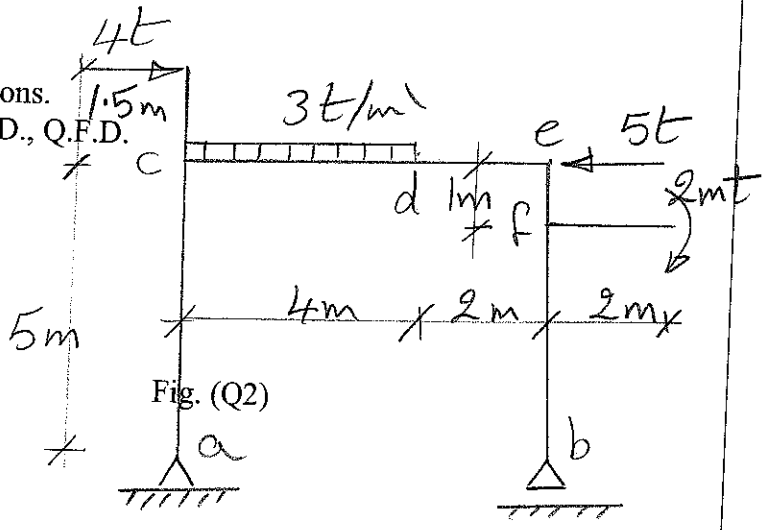


Fig. (Q2)

[a1]	[3 marks]
[a2]	[3 marks]
[a2]	[4 marks]

[Total 10]

Q3

For the shown Frame:

4. Find the reactions.
5. Draw the N.F.D., Q.F.D.
6. Draw B.M.D.

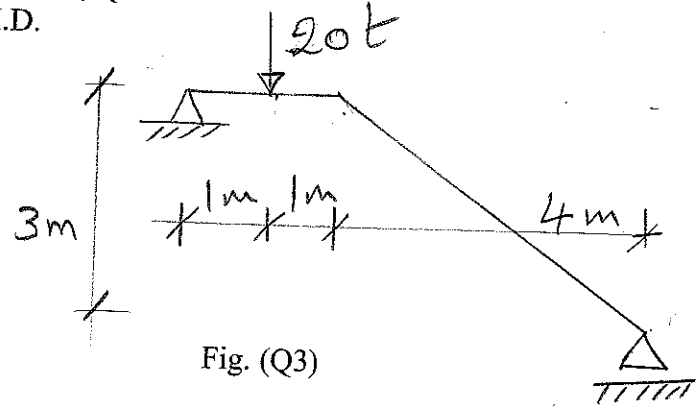


Fig. (Q3)

[a1]	[2 marks]
[a2]	[4 marks]
[a2]	[4 marks]

[Total 10]

Q4

Discuss the stability and determinacy of the shown structure:

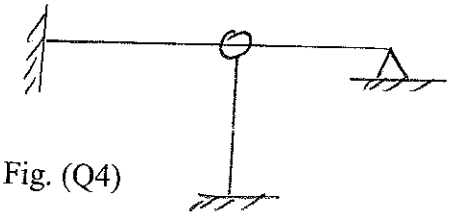


Fig. (Q4)

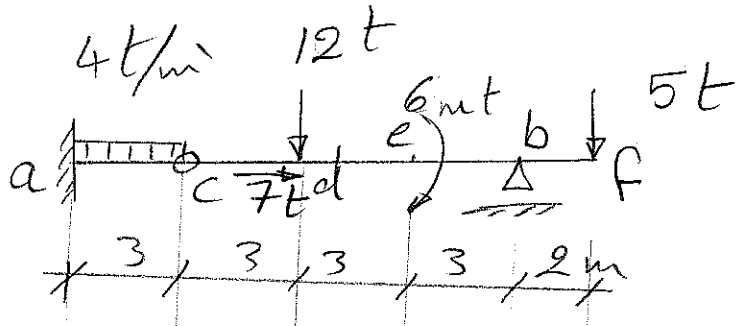
[d1]	[2 marks]

[Total 2]

[Total 30]

Mail:

Q1

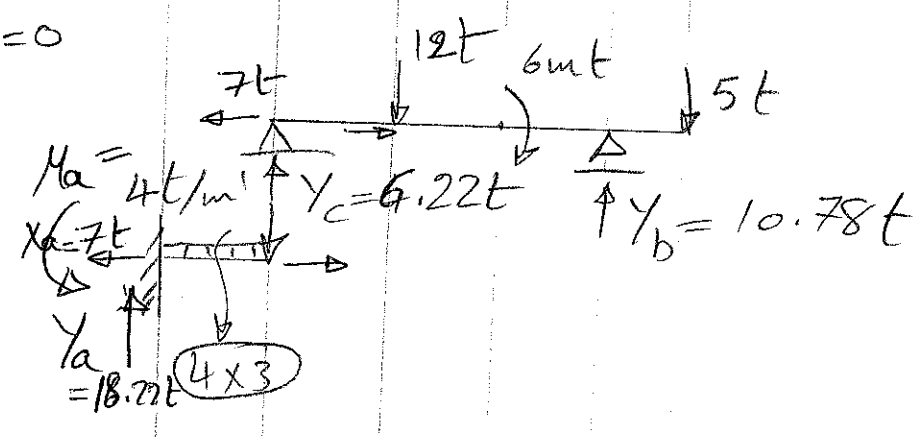


$\Sigma M@c = 0$

$12 \times 3 + 6 - 9Y_b + 5 \times 11 = 0$

$\therefore Y_b = 10.78\ t$

$\therefore Y_c = 6.22\ t$



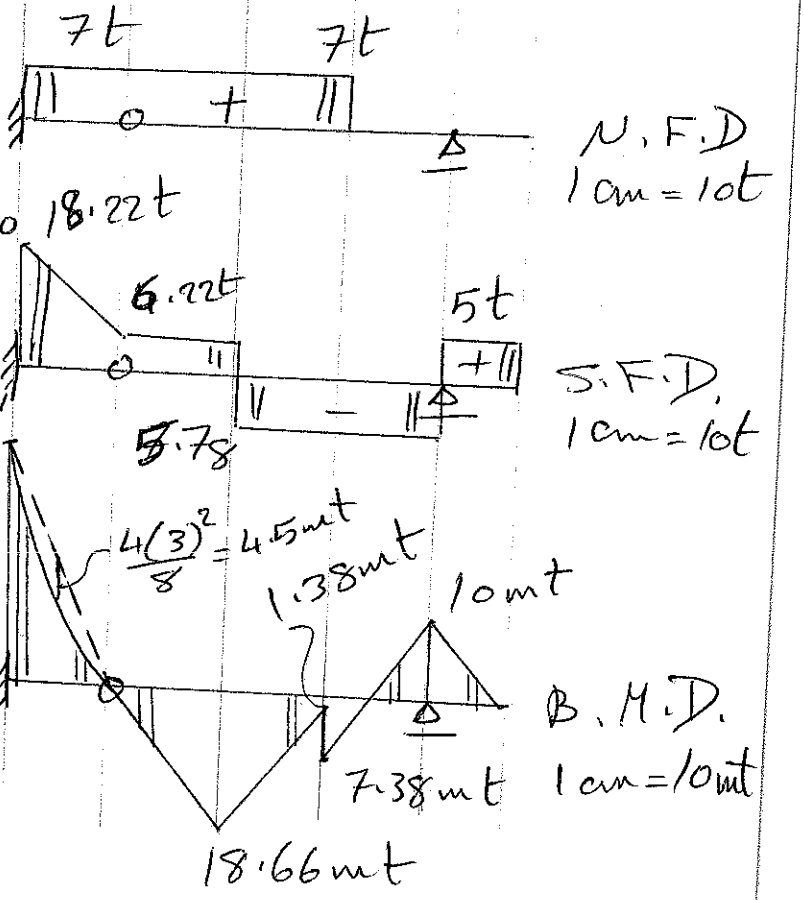
$Y_a = 4 \times 3 + 6.22$

$= 18.22$

$\Sigma M @ a = 0$

$\therefore M_a - 4 \times 3 \times 1.5 - 6.22 \times 3 = 0$

$\therefore M_a = 36.67\ mt$



$M_b = -5 \times 2 = -10\ mt$

$M_{e\,right} = -5 \times 5 + 10.78 \times 3$

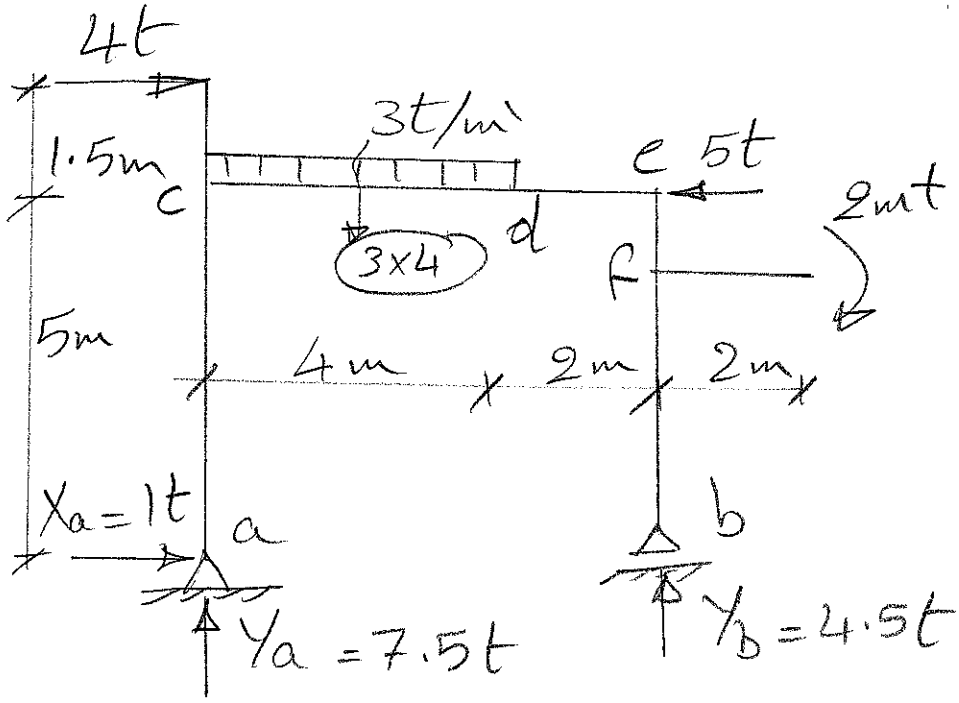
$= +7.38$

$M_{e\,left} = +7.38 - 6$

$= 1.38\ mt$

$M_d = 6.22 \times 3 = 18.66\ mt$

Q2

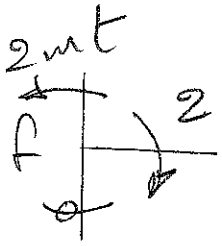


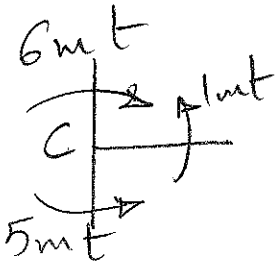
$\Sigma M@a = 0$

$4 \times 6.5 + 3 \times 4 \times 2 + 2 - 5 \times 5 - 6 Y_b = 0$

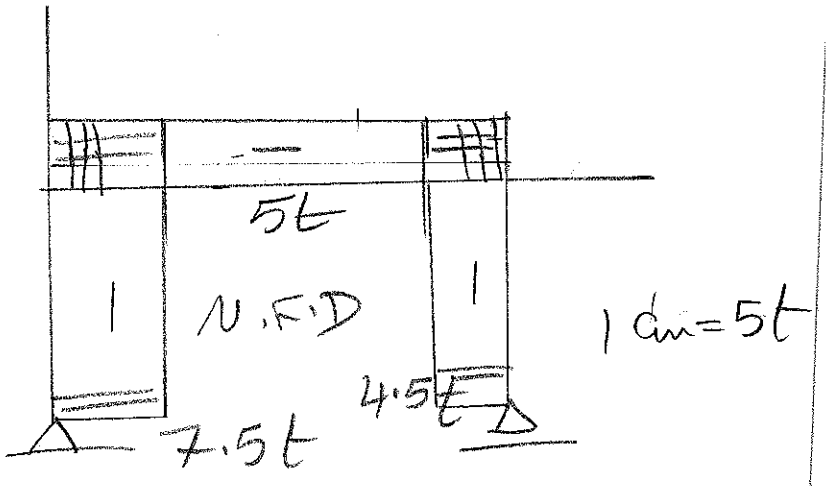
$\therefore Y_b = 4.5t$

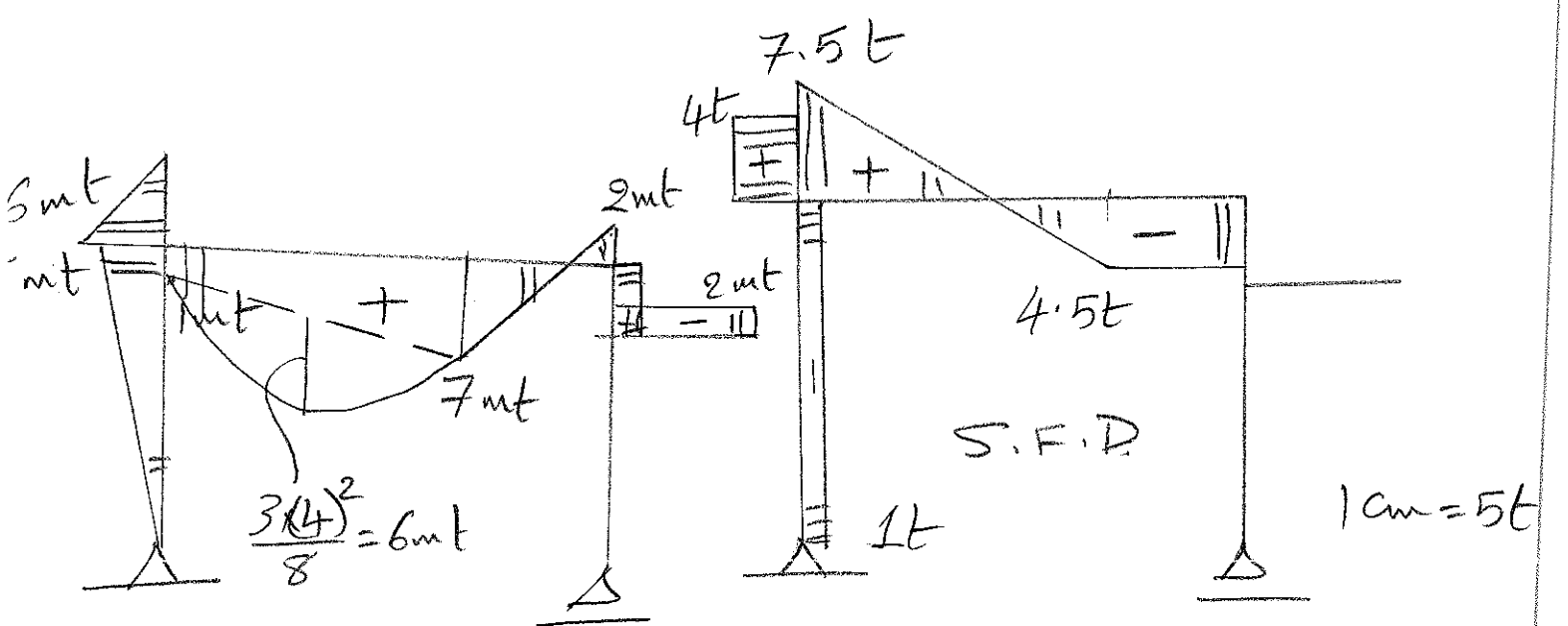
$\therefore Y_a = 7.5t$





$M_d = 4.5 \times 2 - 2 = 7mt$

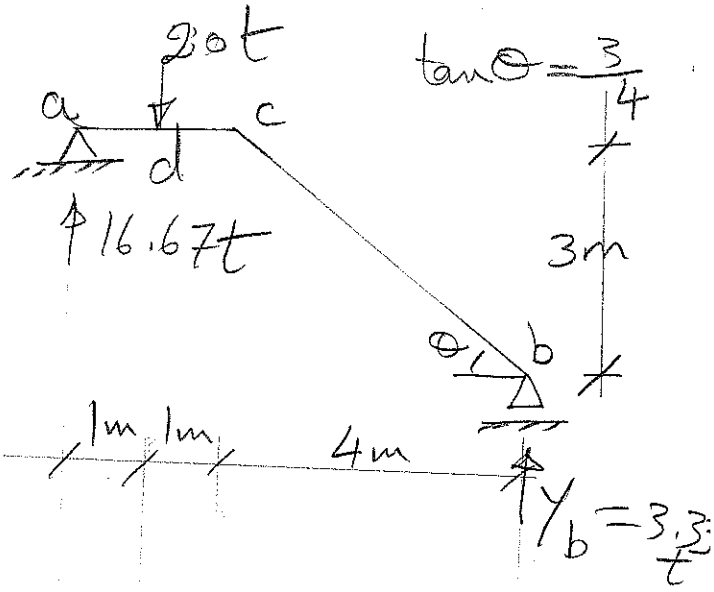




B.M.D

$1cm = 5mt$

Q3



① $\Sigma M_{@a} = 0$

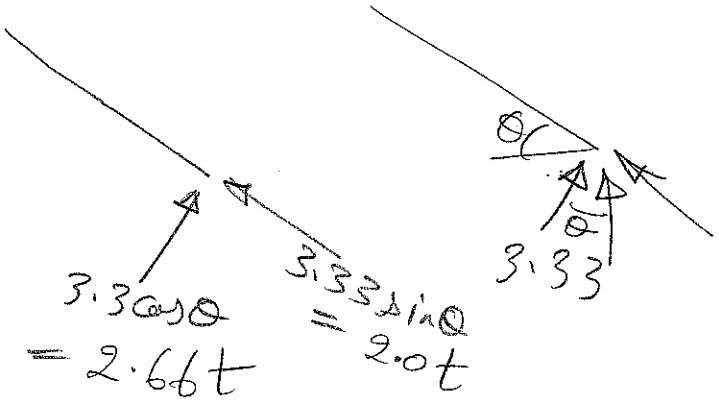
$20 \times 1 - 6Y_b = 0$

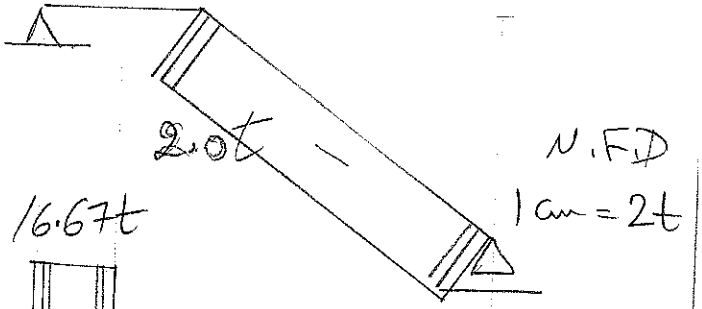
$\therefore Y_b = 3.33t$

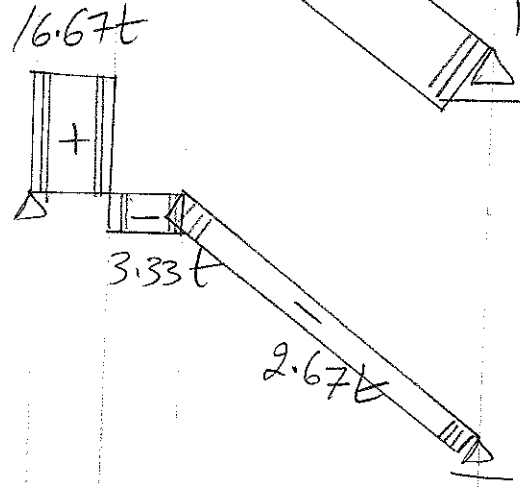
② $\Sigma F_y = 0$

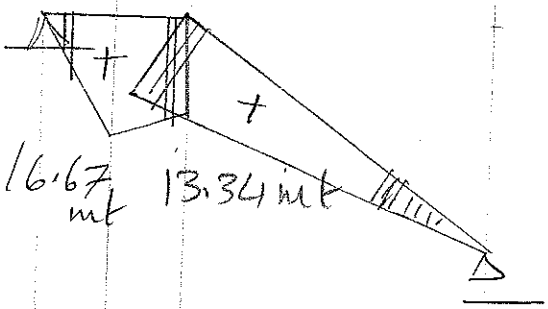
$Y_a + Y_b - 20 = 0$

$\therefore Y_a = 16.67t$



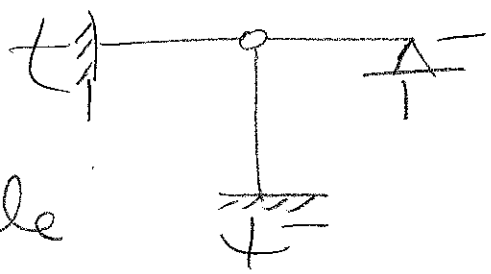






$M_c = 16.67 \times 2 - 20 \times 1 = +13.34$

Q4



Stable

$U = 8$

$E = 3 + (3-1) = 5$

$\therefore$ 3 times st. indeterminate

Higher Technological Institute — Civil Eng. Department

Mid-Term Exam – (Jan-May 2017)

Dr.Manal Kamal Zaki — Theory of Structures (2)-CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1

	ILO's	
For the shown beam:		
1. Separate at C.	[a2]	[2 marks]
2. Find the reactions.	[a2]	[2 marks]
3. Draw the N.F.D., Q.F.D. & BM.D.	[a2]	[4 marks]

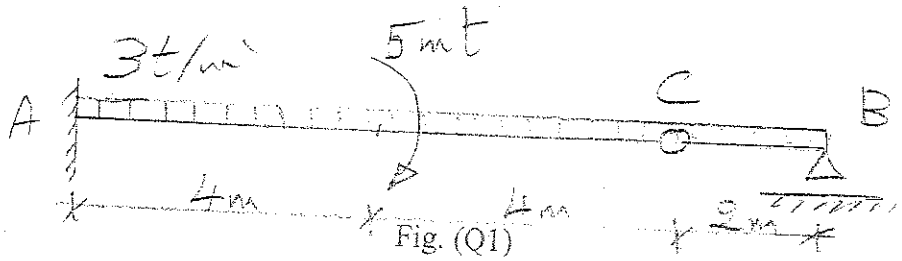


Fig. (Q1)

[Total 8]

Q2

For the shown Frame:

1. Find the reactions.
2. Draw the N.F.D., Q.F.D.
3. Draw B.M.D.

	[a1]	[3 marks]
	[a2]	[3 marks]
	[a2]	[4 marks]

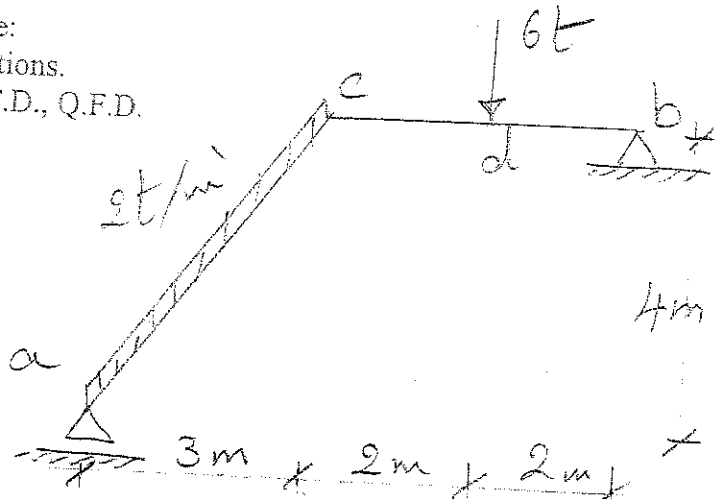


Fig. (Q2)

[Total 10]

Q3

For the shown Frame:

4. Find the reactions.
5. Draw the N.F.D., Q.F.D.
6. Draw B.M.D.

	[a1]	[4 marks]
	[a2]	[4 marks]
	[a2]	[4 marks]

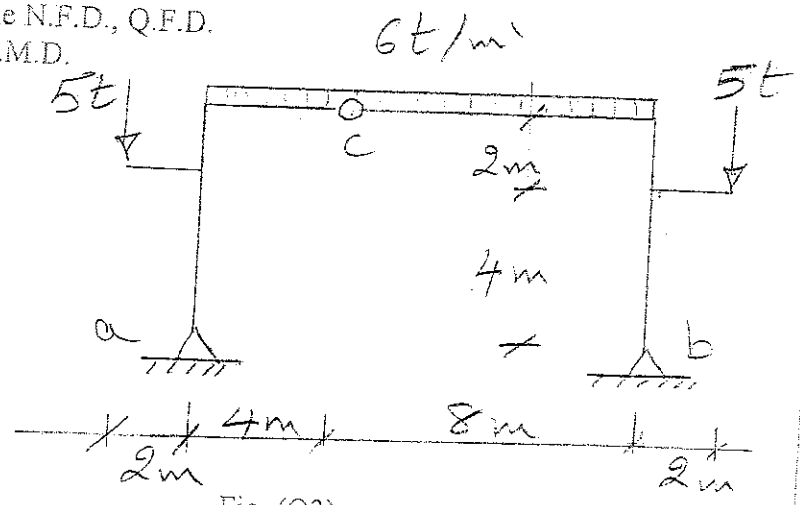


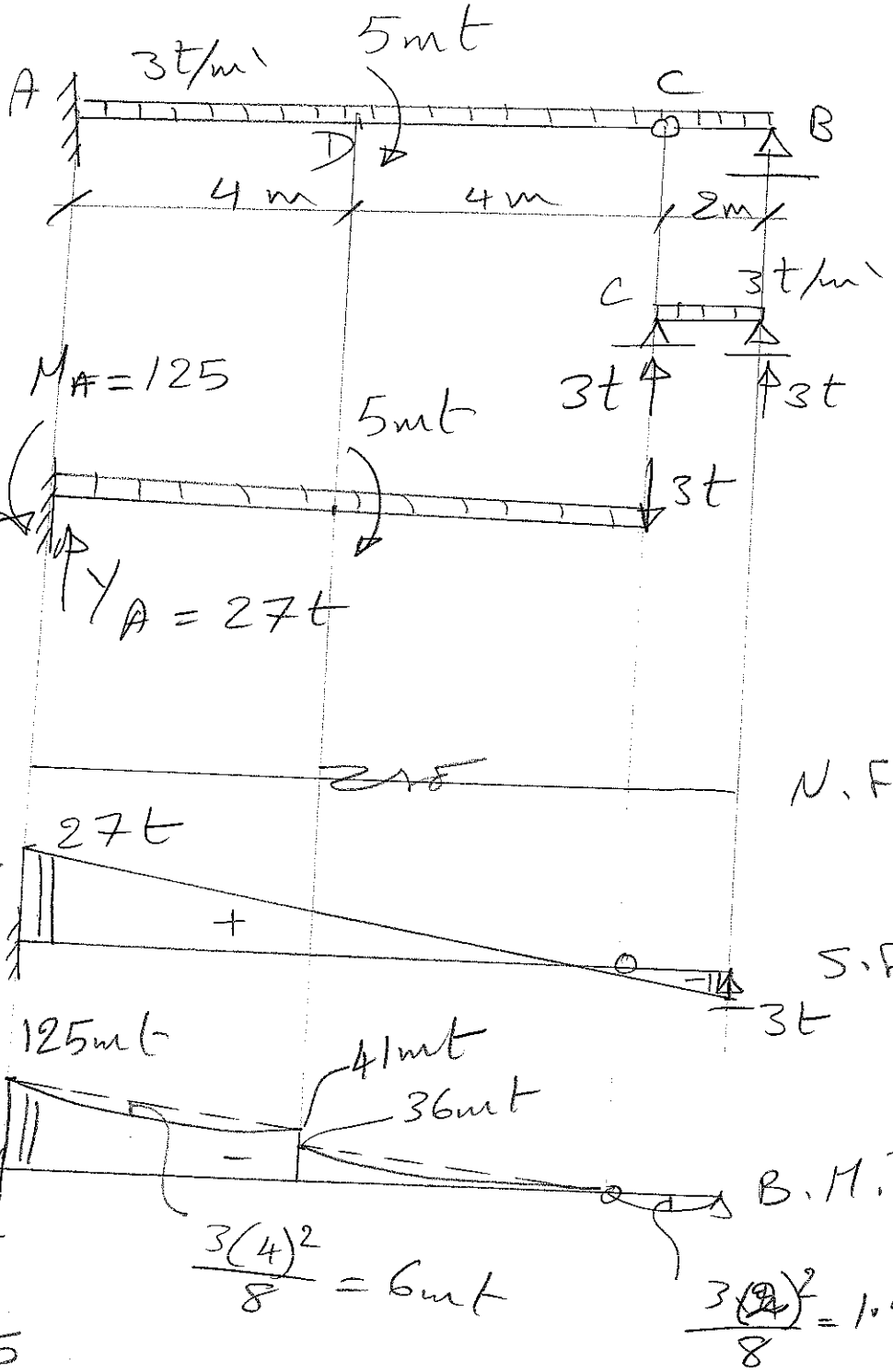
Fig. (Q3)

[Total 12]

[Total 30]

Mail:

Q1



$\Sigma F_y = 0$

$Y_A = 3 + 3\times 8$

$= 27t$

$\Sigma M @ A = 0$

$\therefore -M_A - 3\times 8\times 4$

$-5 - 3\times 8 = 0$

$\therefore M_A = 125mt$

M_D right $= 3\times 4$

$+ 3\times 4\times 2$

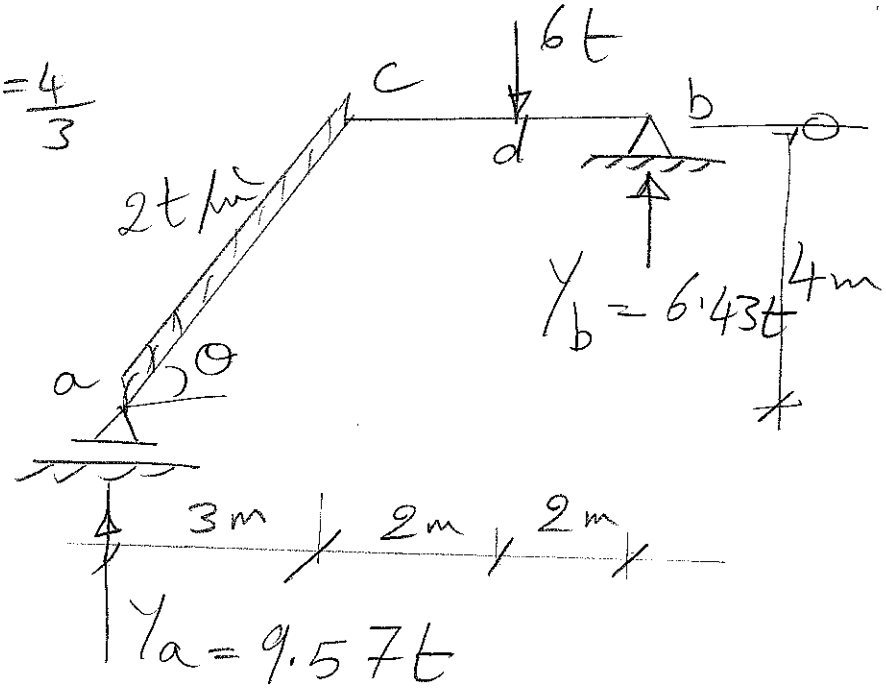
$= 36mt$

M_D left $= 36 + 5$

$= 41mt$

Q2

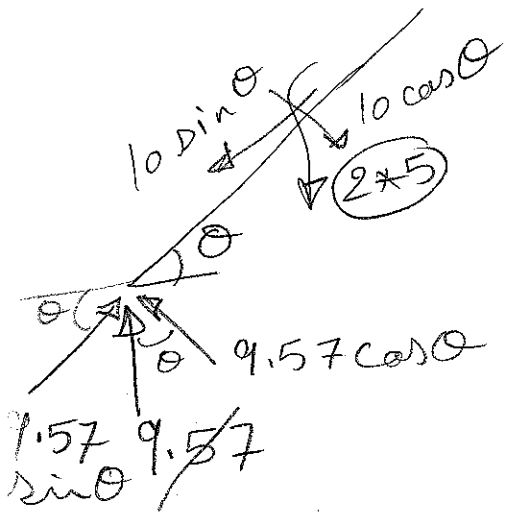
$\tan\theta = \frac{4}{3}$

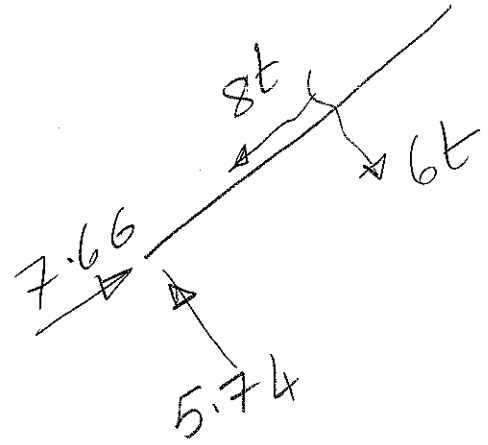


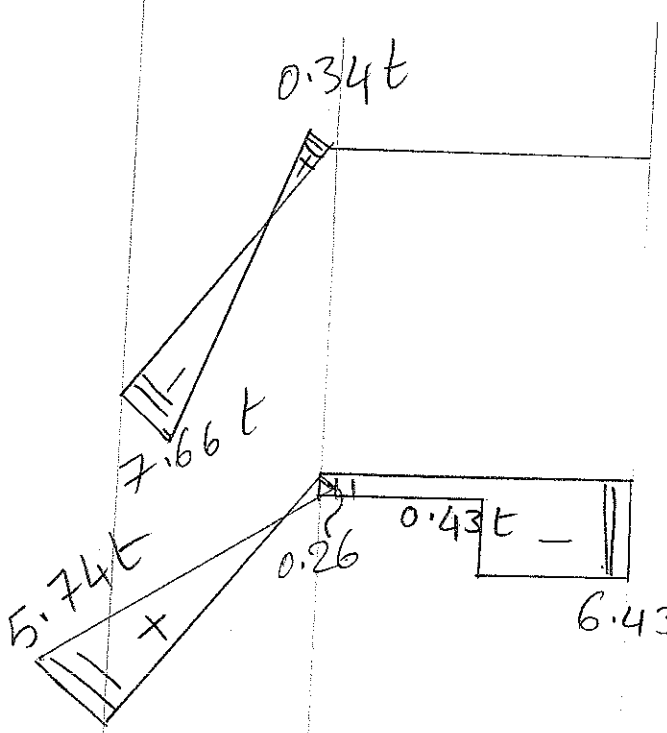
$\Sigma M@b = 0$

$6*2 + 2*5*5.5 - 7Y_a = 0$

$\therefore Y_a = 9.57t$

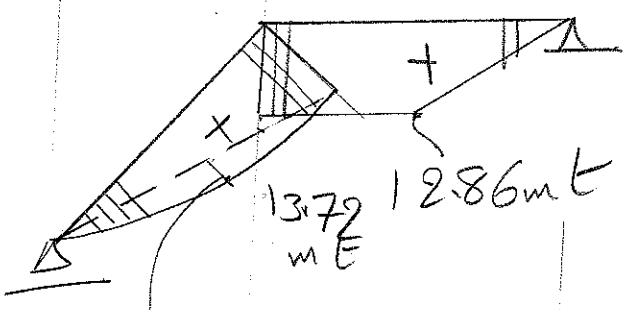






N.F.D.

S.F.D.

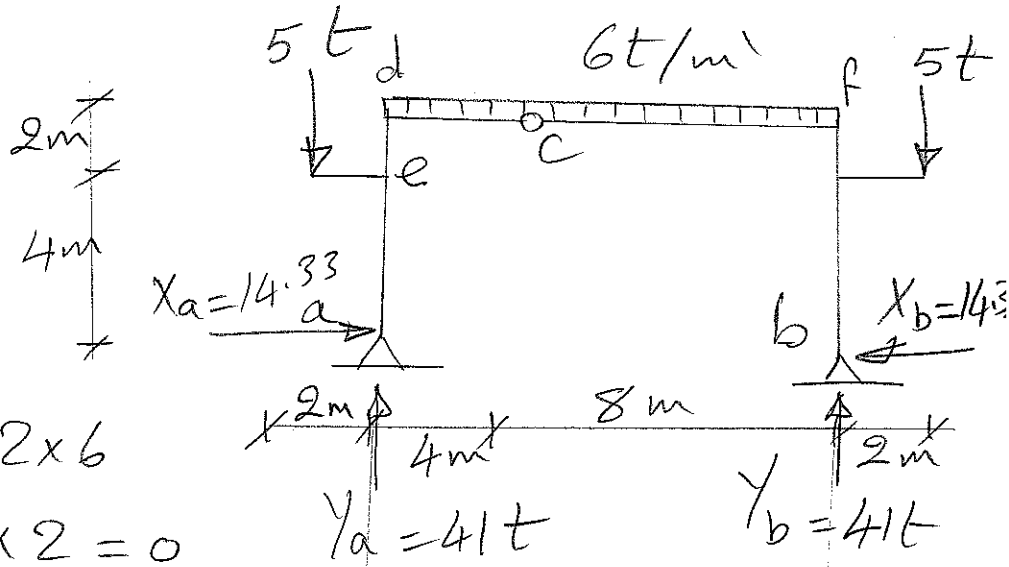


B.M.D.

$M_C = 6.43 \times 4 - 6 \times 2$

$\frac{2(5)(3)}{8} = 3.75$

Q3



$\Sigma M @ b = 0$

$5 \times 14 + 6 \times 12 \times 6 - 12 Y_a - 5 \times 2 = 0$

$\therefore Y_a = 41\,t$

$\Sigma M @ c_{right} = 0$

$6 \times 8 \times 4 + 5 \times 10 + 6 X_b - 41 \times 8 = 0$

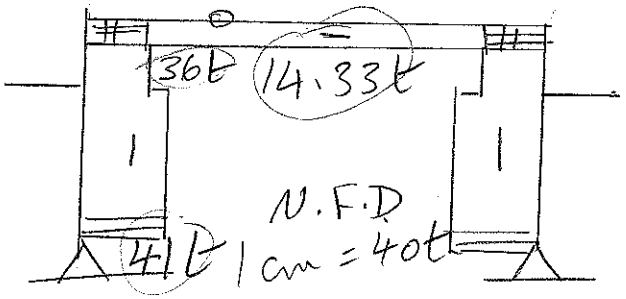
$\therefore X_b = 14.33\,t$

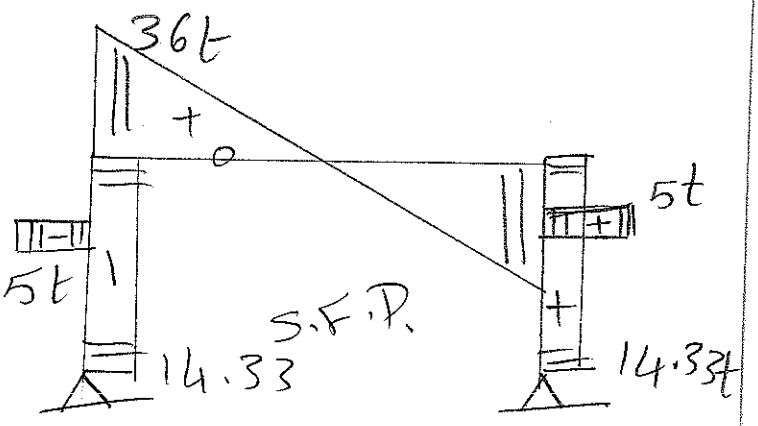
check

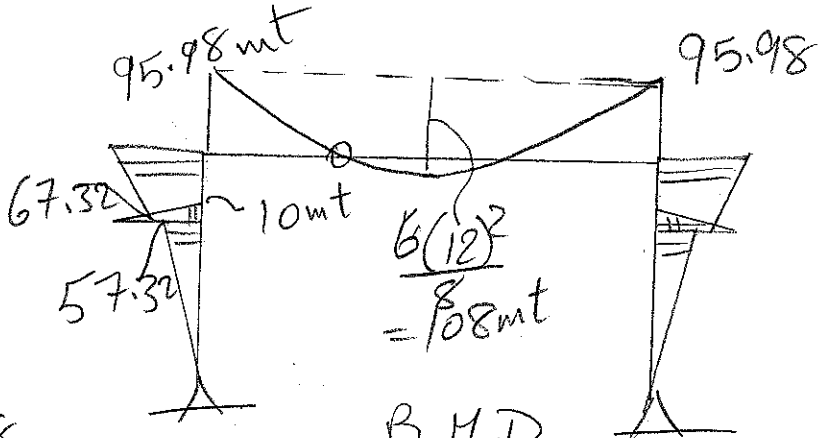
$\Sigma M @ c_{left} = 0$

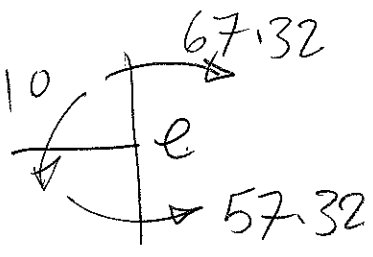
$6 \times 4 \times 2 + 5 \times 6 + 6 X_a - 41 \times 4 = 0$

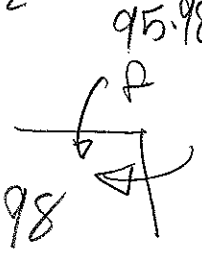
$\therefore X_a = 14.33\,t$











$M_e = 14.33 \times 6 + 5 \times 2 = 95.98$

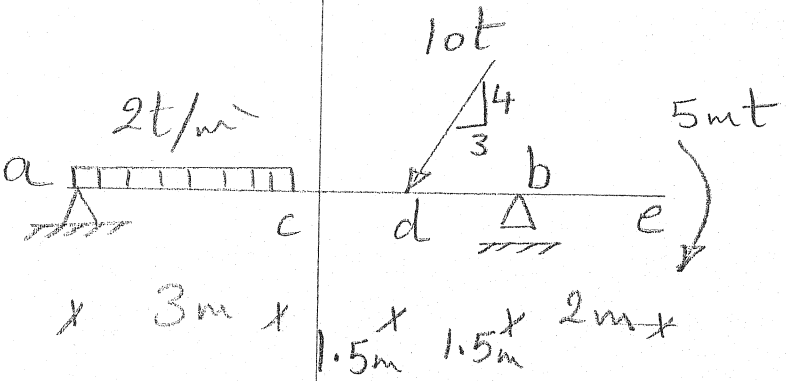
Higher Technological Institute
10th Ramadan City
(6th October Branch)
Department of Civil Engineering

Course :Theory of structures 2 (CT 112) **Term : Jan.-May 2018**
Examiner: Dr.Manal Kamal Zaki **Time : 90 min**

Mid Term Exam

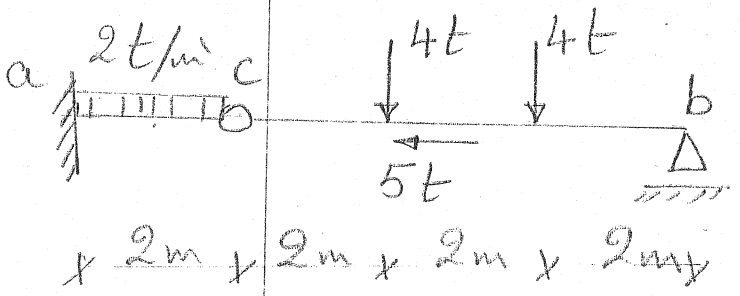
Question 1 [a2,b3,c2] **{10 Marks}**
For the shown beam:

1. Find the reactions. {3 M}
2. Draw the N.F.D., Q.F.D. {4 M}
3. Draw the B.M.D. {3 M}



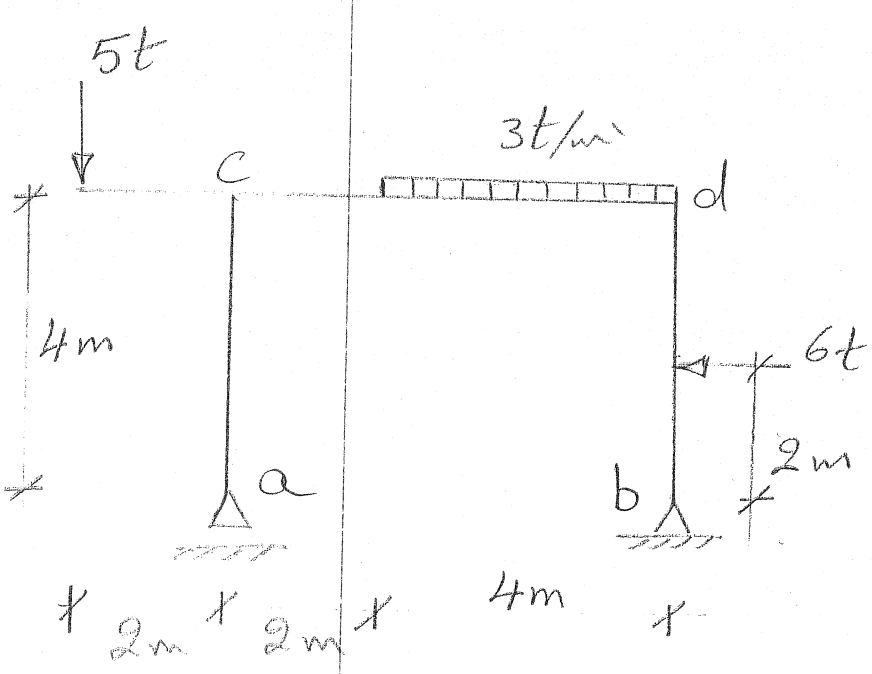
Question 2 [a2,b3,c2] **{10 Marks}**
For the shown beam:

1. Separate at C. {1 M}
2. Find the reactions. {2 M}
3. Draw the N.F.D., Q.F.D. {4 M}
4. Draw the B.M.D. {3 M}



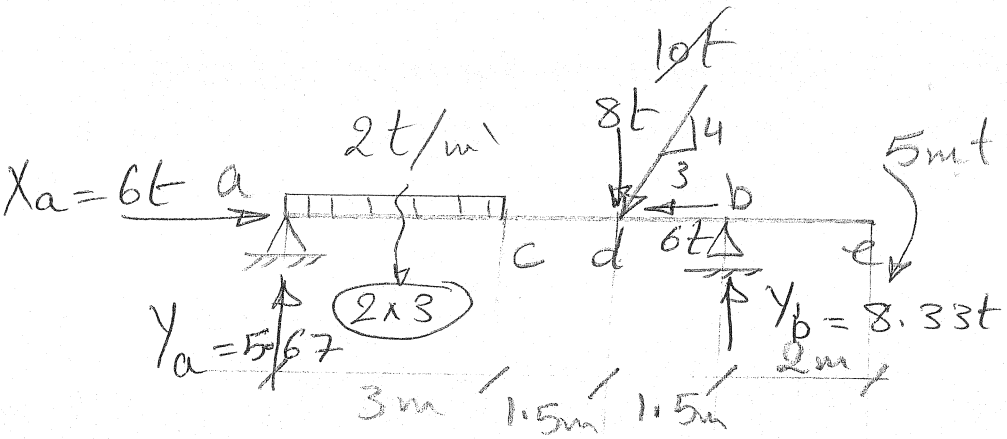
Question 3 [a2,b3,c2] **{10 Marks}**
For the shown Frame:

1. Find the reactions. {3 M}
2. Draw the N.F.D., Q.F.D. {4 M}
3. Draw B.M.D. {3 M}



Examination committee: 1-Name Signature
2-Name Signature

Q1



① $\Sigma M @ a = 0$

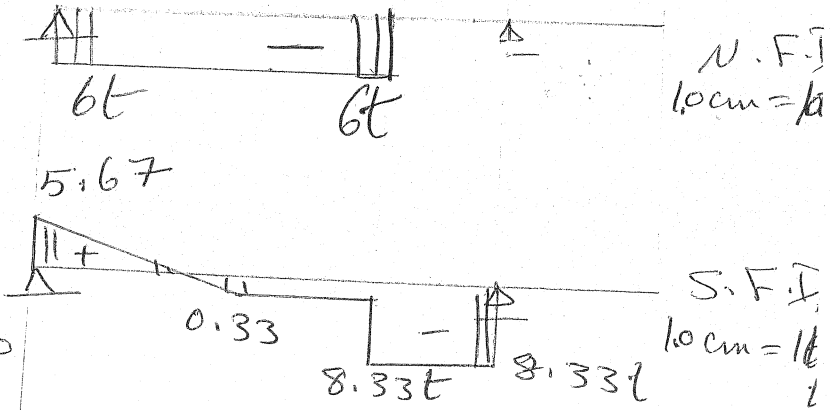
$2 \times 3 \times 1.5 + 8 \times 4.5 - 6Y_b + 5 = 0$

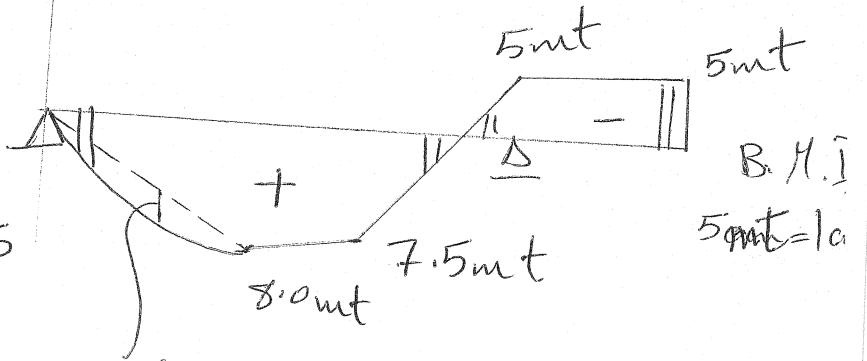
$\therefore \boxed{Y_b = 8.33t}$

② $\Sigma F_y = 0$

$Y_a - 2 \times 3 - 8 + 8.33 = 0$

$\therefore \boxed{Y_a = 5.67t}$





$M_c = 5.67 \times 3 - 2 \times 3 \times 1.5$

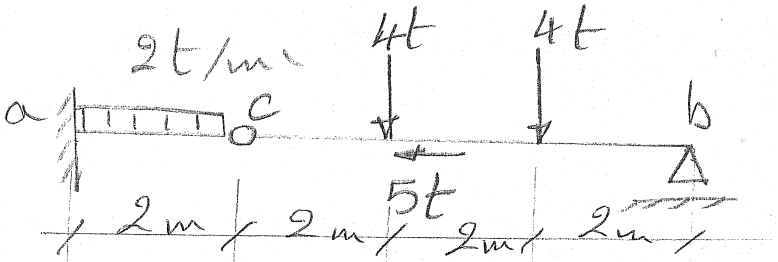
$= 8.01$ mt

$\frac{2(3)^2}{8} = 2.25$ mt

$M_d = -5 + 8.33 \times 1.5$

$M_d = 7.5$ mt

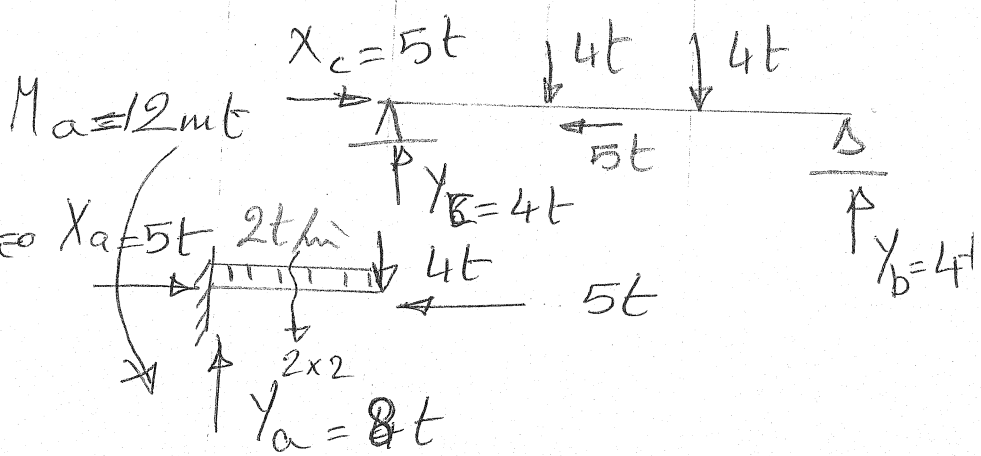
Q2

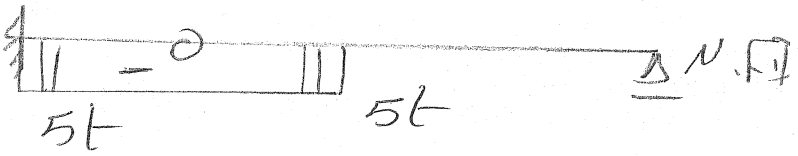


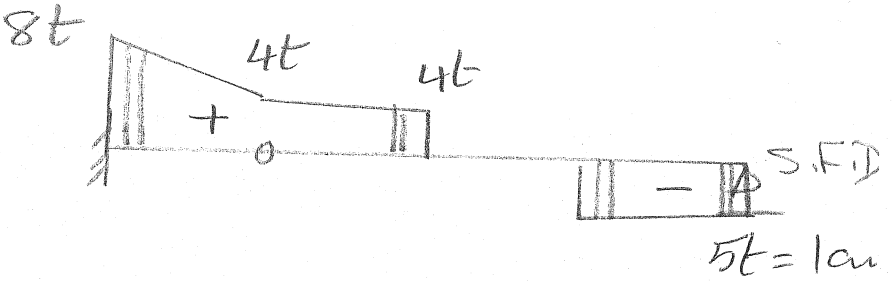
① $\Sigma M @ a = 0$

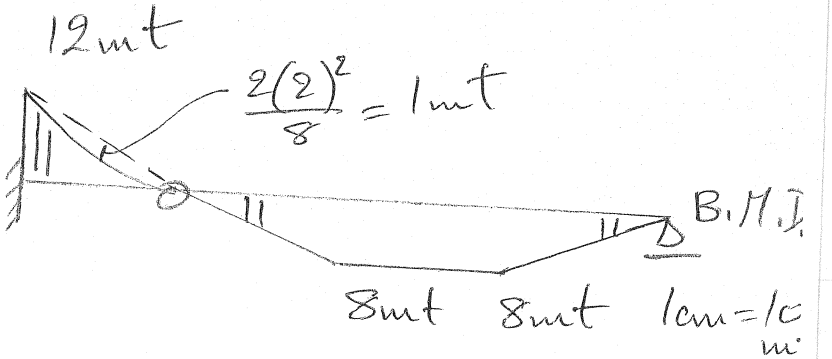
$2 \times 2 \times 1 + 4 \times 2 - M_a = 0$

$\therefore M_a = 12 mt$

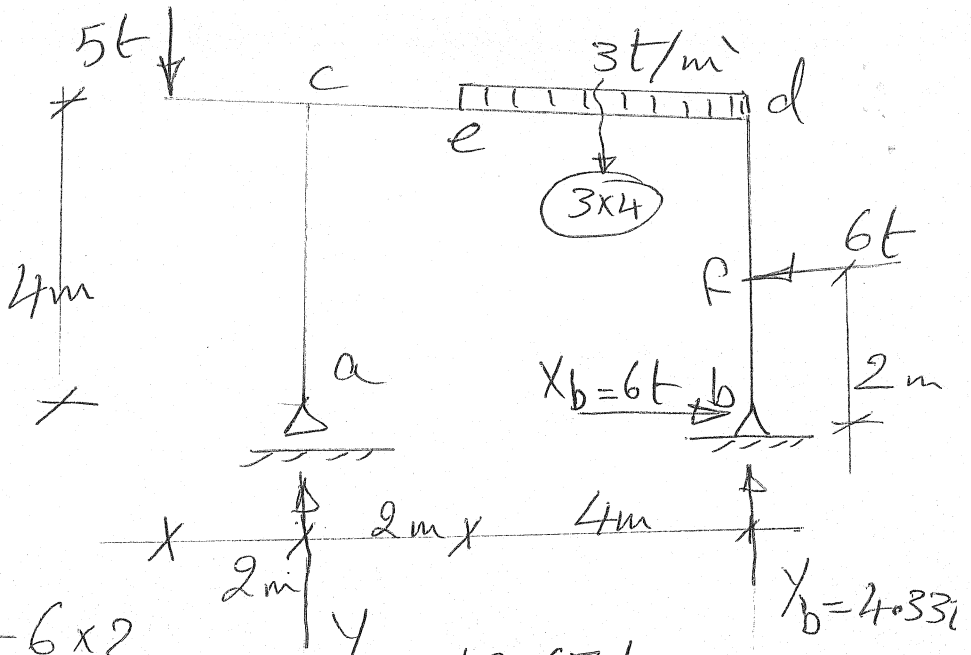








Q3



① $\Sigma M_{@b} = 0$

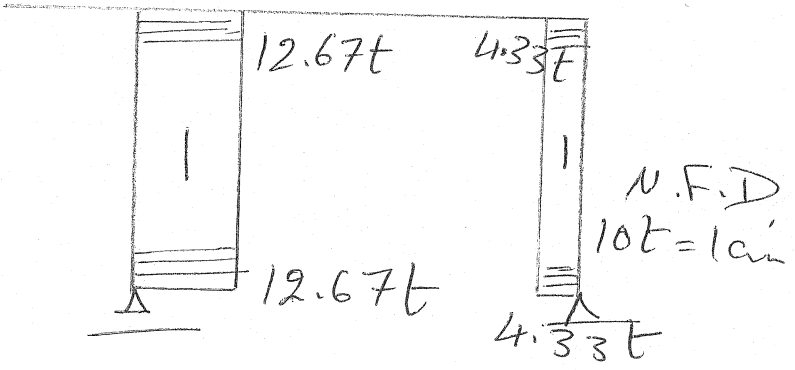
$5*8 + 3x4x2 + 6x2 - 6Y_a = 0$

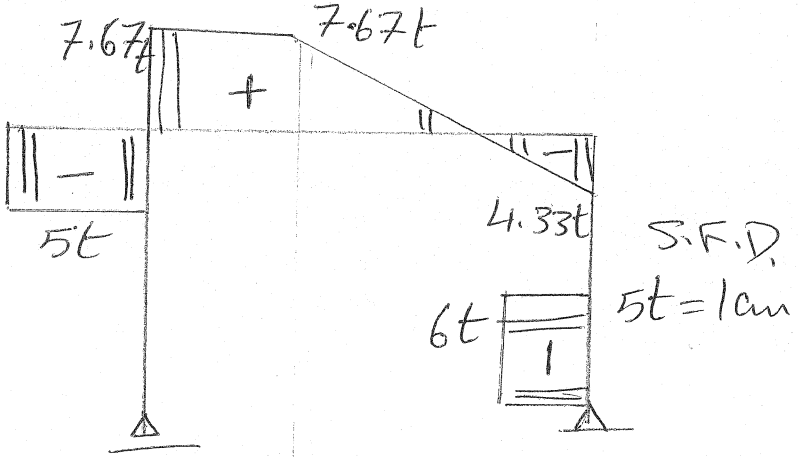
$\therefore \boxed{Y_a = 12.67t}$

② $\Sigma F_y = 0$

$12.67 - 5 - 3x4 + Y_b = 0$

$\therefore \boxed{Y_b = 4.33t}$



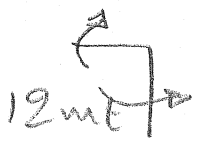


$M_e = 12.67x2 - 5x4$

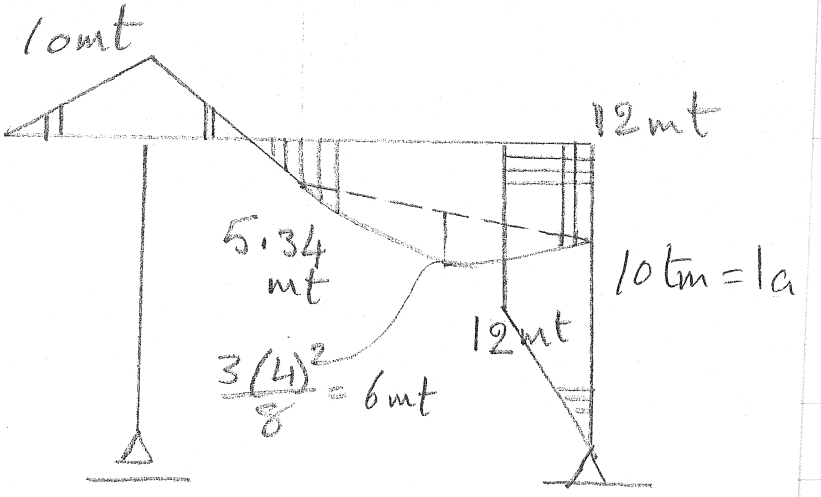
$= 5.34 mt$

$M_d = 6x4 - 6x2$

$= 12 mt$



$M_f = 6x2 = 12mt$



Higher Technological Institute — Civil Eng. Department

Mid-Term Exam – (Jan-May 2017)

Dr.Manal Kamal Zaki — Theory of Structures (2)-CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1

For the shown beam:

1. Separate at C.
2. Find the reactions.
3. Draw the N.F.D., Q.F.D. & BM.D.

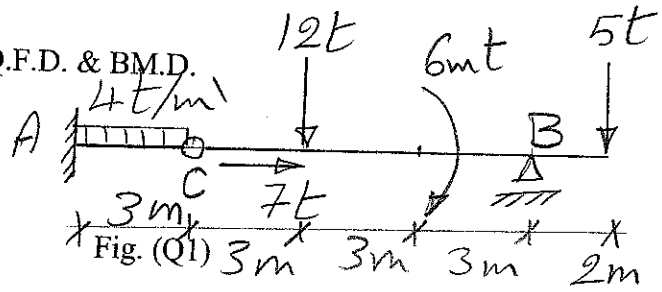


Fig. (Q1)

ILO's	
[a2]	[2 marks]
[a2]	[2 marks]
[a2]	[4 marks]

[Total 8]

Q2

For the shown Frame:

1. Find the reactions.
2. Draw the N.F.D., Q.F.D.
3. Draw B.M.D.

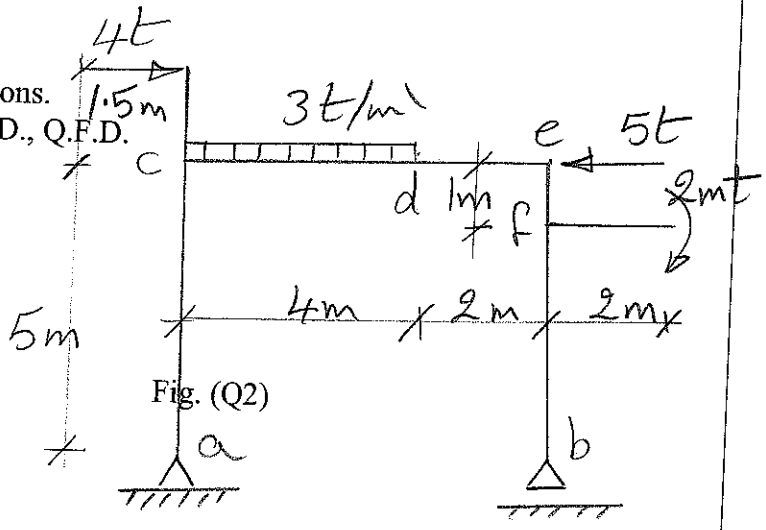


Fig. (Q2)

[a1]	[3 marks]
[a2]	[3 marks]
[a2]	[4 marks]

[Total 10]

Q3

For the shown Frame:

4. Find the reactions.
5. Draw the N.F.D., Q.F.D.
6. Draw B.M.D.

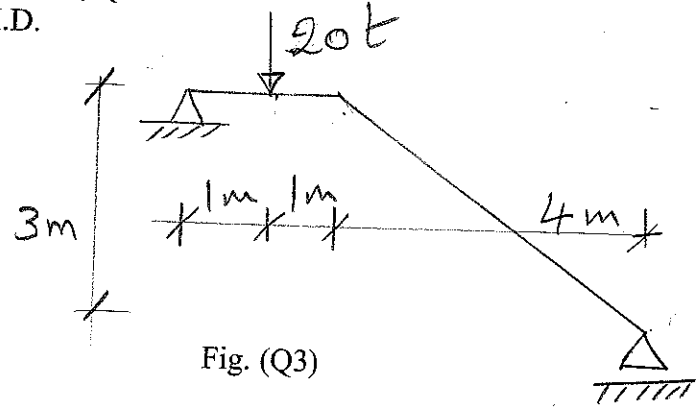


Fig. (Q3)

[a1]	[2 marks]
[a2]	[4 marks]
[a2]	[4 marks]

[Total 10]

Q4

Discuss the stability and determinacy of the shown structure:

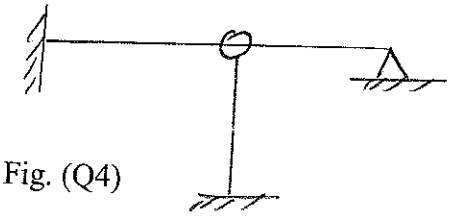


Fig. (Q4)

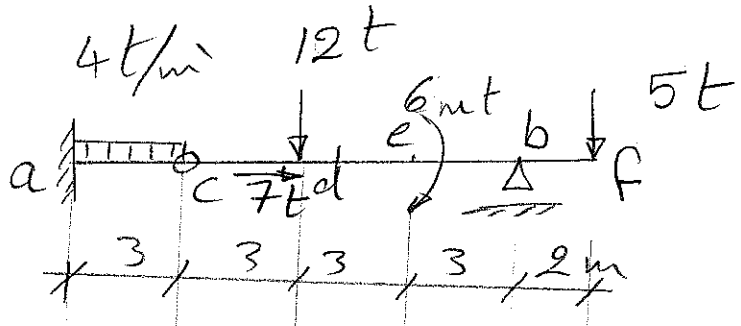
[d1]	[2 marks]

[Total 2]

[Total 30]

Mail:

Q1

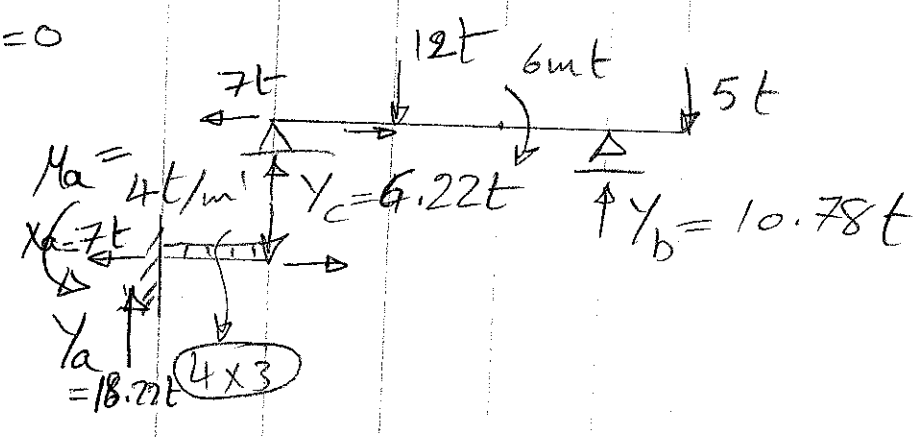


$\Sigma M@c = 0$

$12 \times 3 + 6 - 9Y_b + 5 \times 11 = 0$

$\therefore Y_b = 10.78\ t$

$\therefore Y_c = 6.22\ t$



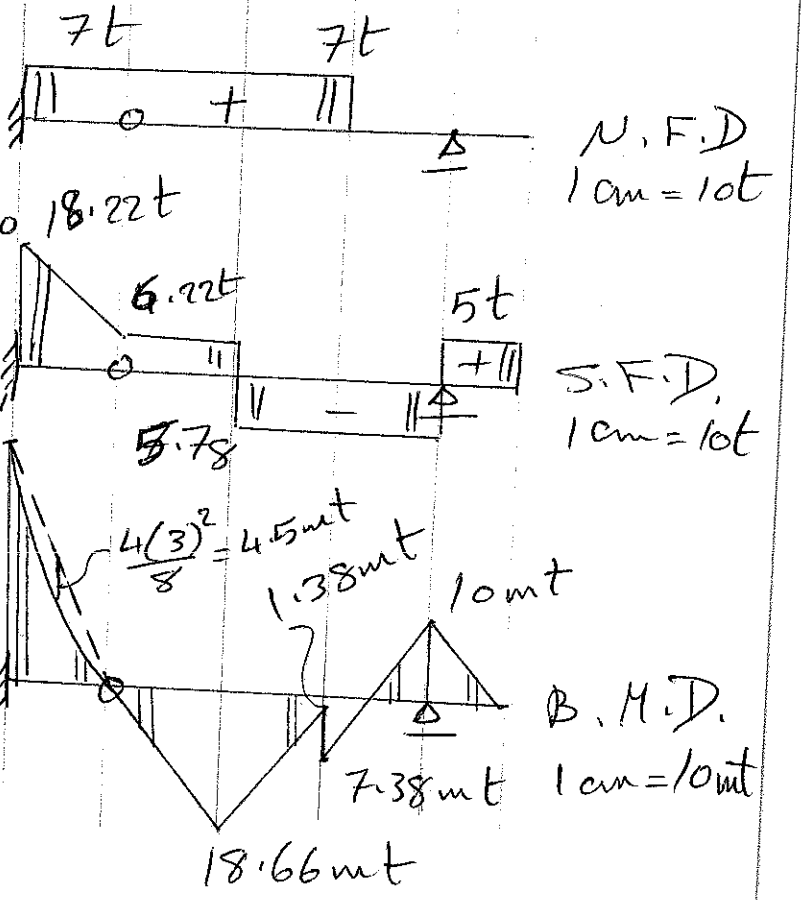
$Y_a = 4 \times 3 + 6.22$

$= 18.22$

$\Sigma M @ a = 0$

$\therefore M_a - 4 \times 3 \times 1.5 - 6.22 \times 3 = 0$

$\therefore M_a = 36.67\ mt$



$M_b = -5 \times 2 = -10\ mt$

$M_{e\,right} = -5 \times 5 + 10.78 \times 3$

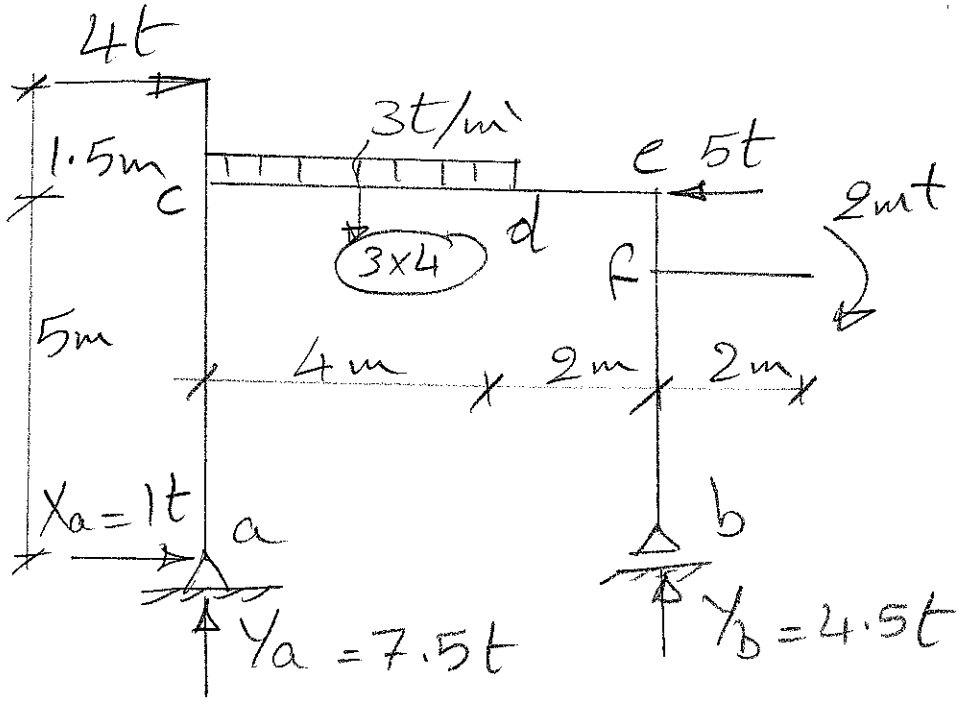
$= +7.38$

$M_{e\,left} = +7.38 - 6$

$= 1.38\ mt$

$M_d = 6.22 \times 3 = 18.66\ mt$

Q2

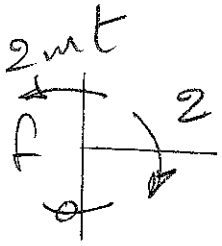


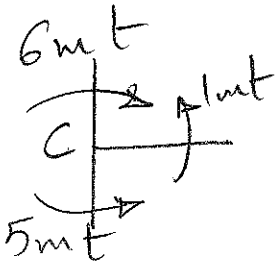
$\Sigma M@a = 0$

$4 \times 6.5 + 3 \times 4 \times 2 + 2 - 5 \times 5 - 6 Y_b = 0$

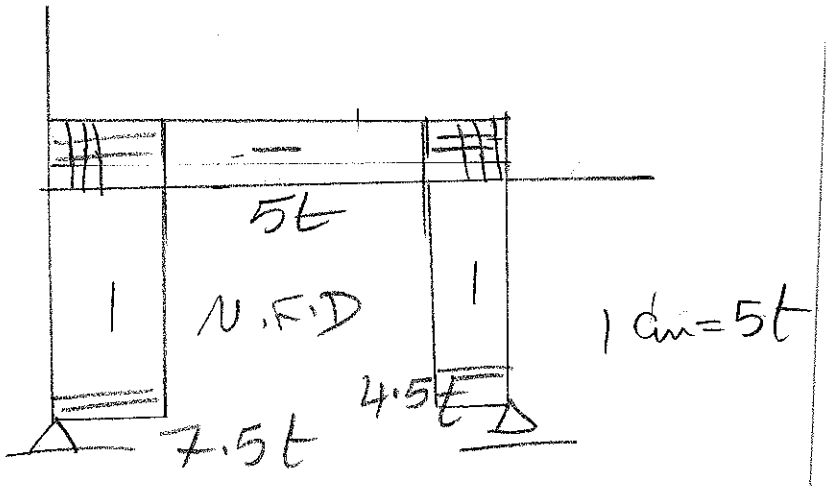
$\therefore Y_b = 4.5t$

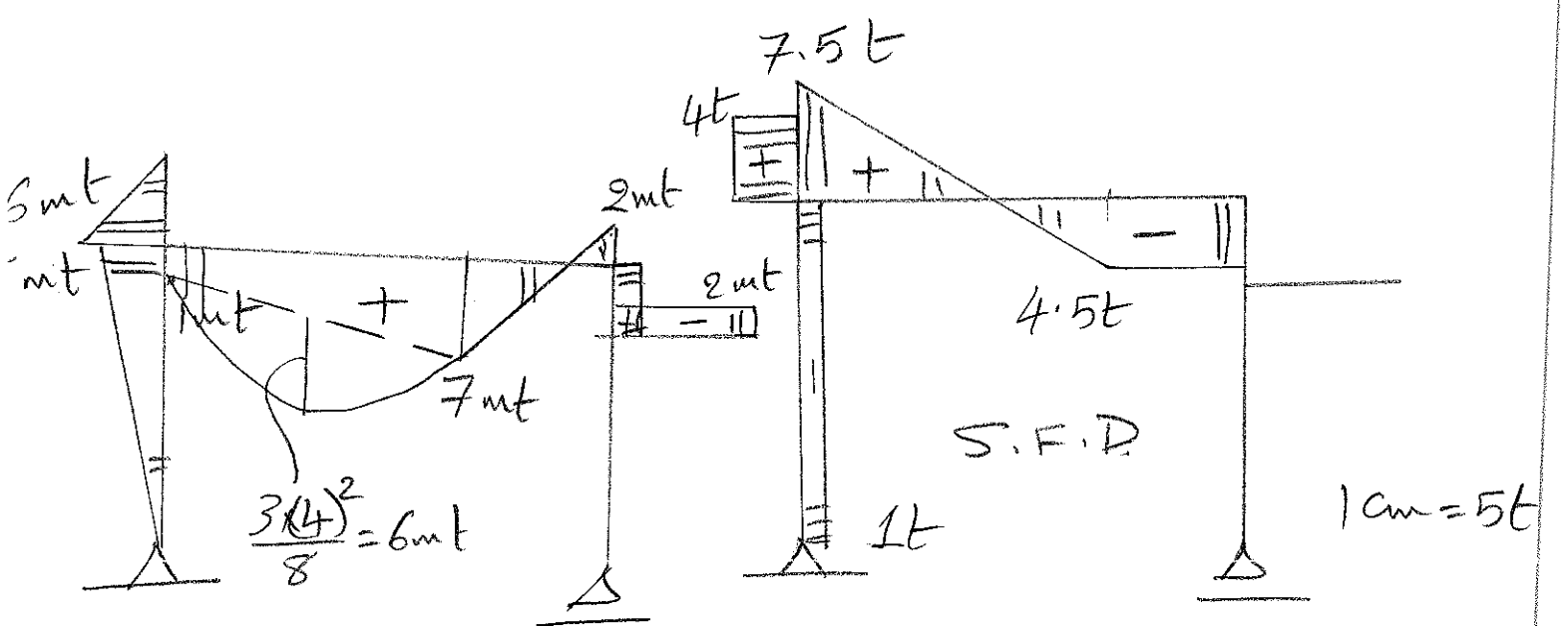
$\therefore Y_a = 7.5t$





$M_d = 4.5 \times 2 - 2 = 7mt$

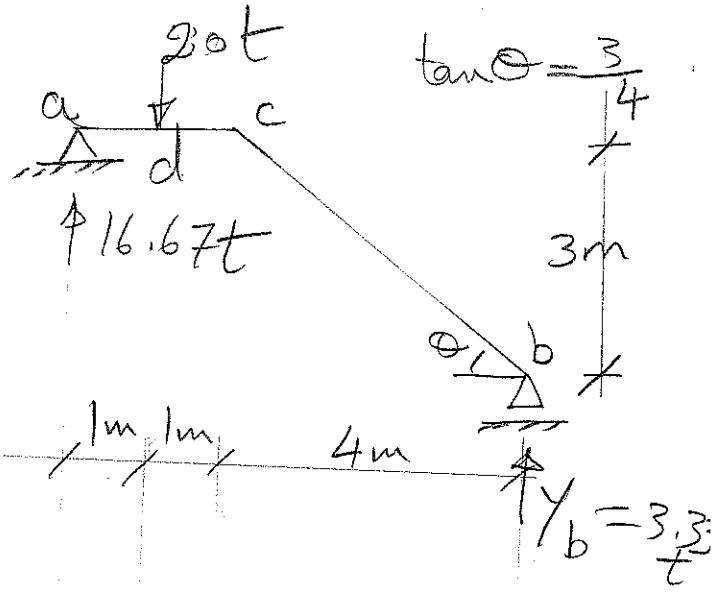




B.M.D

$1cm = 5mt$

Q3



① $\Sigma M_{@a} = 0$

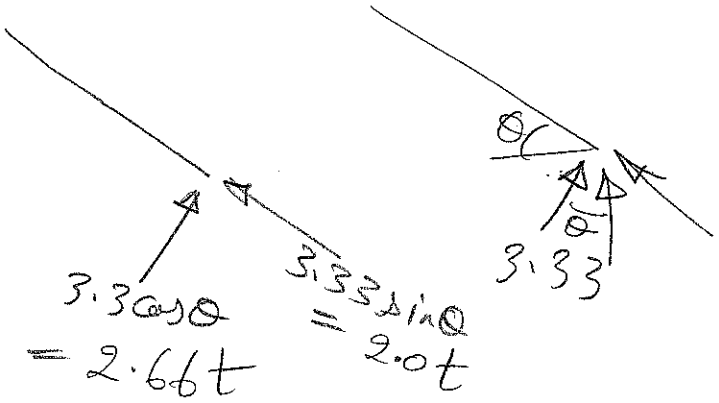
$20 \times 1 - 6Y_b = 0$

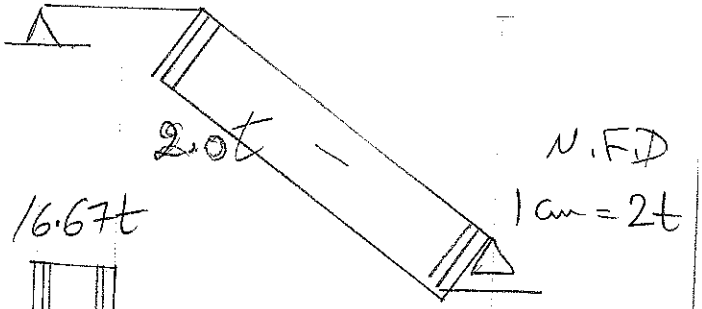
$\therefore Y_b = 3.33t$

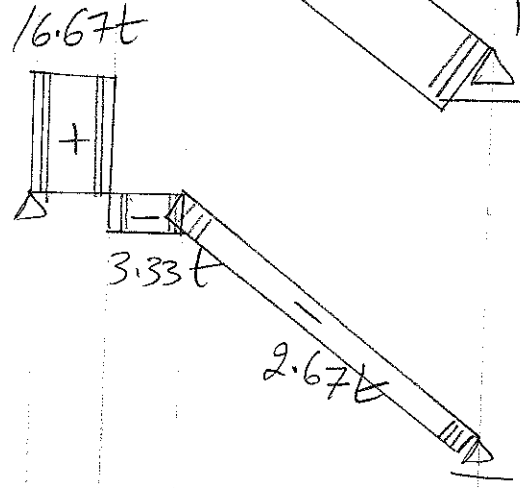
② $\Sigma F_y = 0$

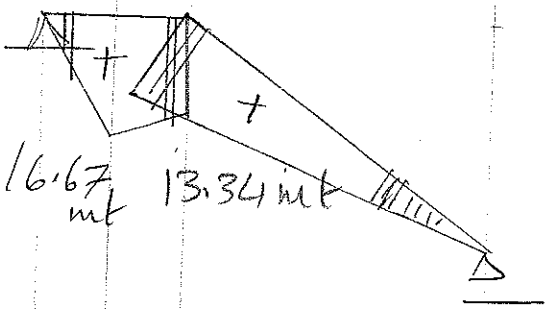
$Y_a + Y_b - 20 = 0$

$\therefore Y_a = 16.67t$



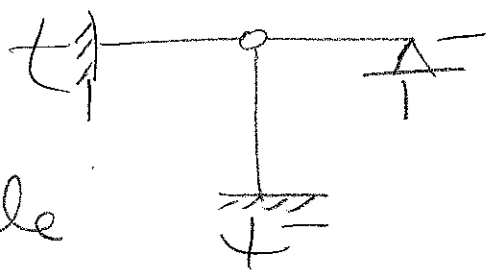






$M_c = 16.67 \times 2 - 20 \times 1 = +13.34$

Q4



Stable

$U = 8$

$E = 3 + (3-1) = 5$

$\therefore$ 3 times st. indeterminate

Higher Technological Institute — Civil Eng. Department

Mid-Term Exam – (Jan-May 2017)

Dr.Manal Kamal Zaki — Theory of Structures (2)-CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1

	ILO's	
For the shown beam:		
1. Separate at C.	[a2]	[2 marks]
2. Find the reactions.	[a2]	[2 marks]
3. Draw the N.F.D., Q.F.D. & BM.D.	[a2]	[4 marks]

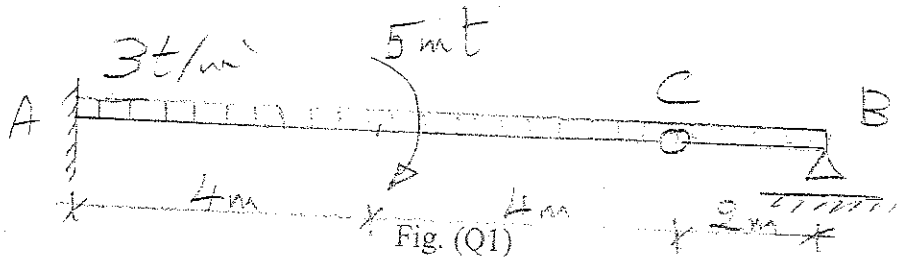


Fig. (Q1)

[Total 8]

Q2

For the shown Frame:

1. Find the reactions.
2. Draw the N.F.D., Q.F.D.
3. Draw B.M.D.

	[a1]	[3 marks]
	[a2]	[3 marks]
	[a2]	[4 marks]

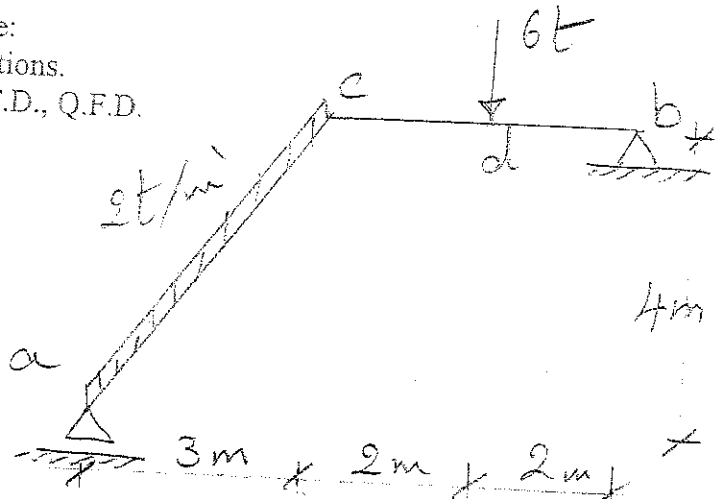


Fig. (Q2)

[Total 10]

Q3

For the shown Frame:

4. Find the reactions.
5. Draw the N.F.D., Q.F.D.
6. Draw B.M.D.

	[a1]	[4 marks]
	[a2]	[4 marks]
	[a2]	[4 marks]

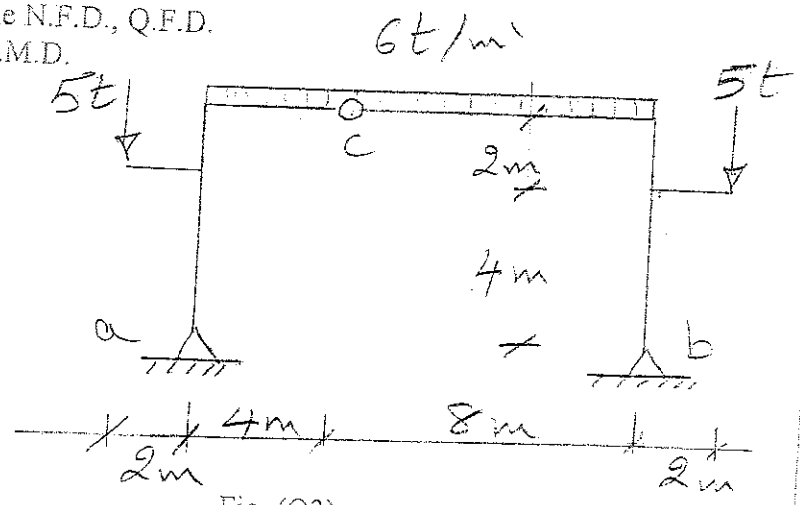


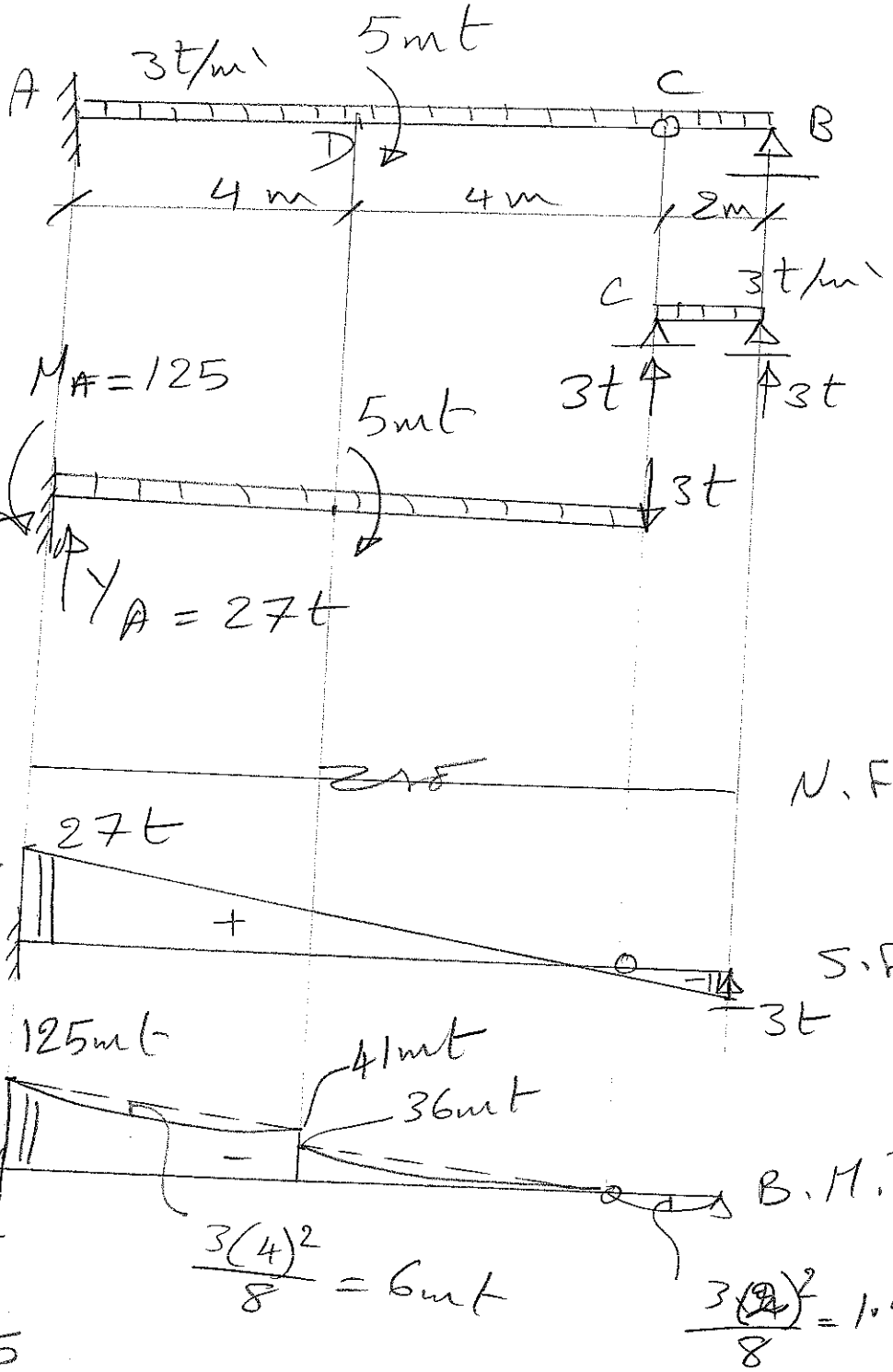
Fig. (Q3)

[Total 12]

[Total 30]

Mail:

Q1



$\Sigma F_y = 0$

$Y_A = 3 + 3\times 8$

$= 27t$

$\Sigma M @ A = 0$

$\therefore -M_A - 3\times 8\times 4$

$-5 - 3\times 8 = 0$

$\therefore M_A = 125mt$

M_D right $= 3\times 4$

$+ 3\times 4\times 2$

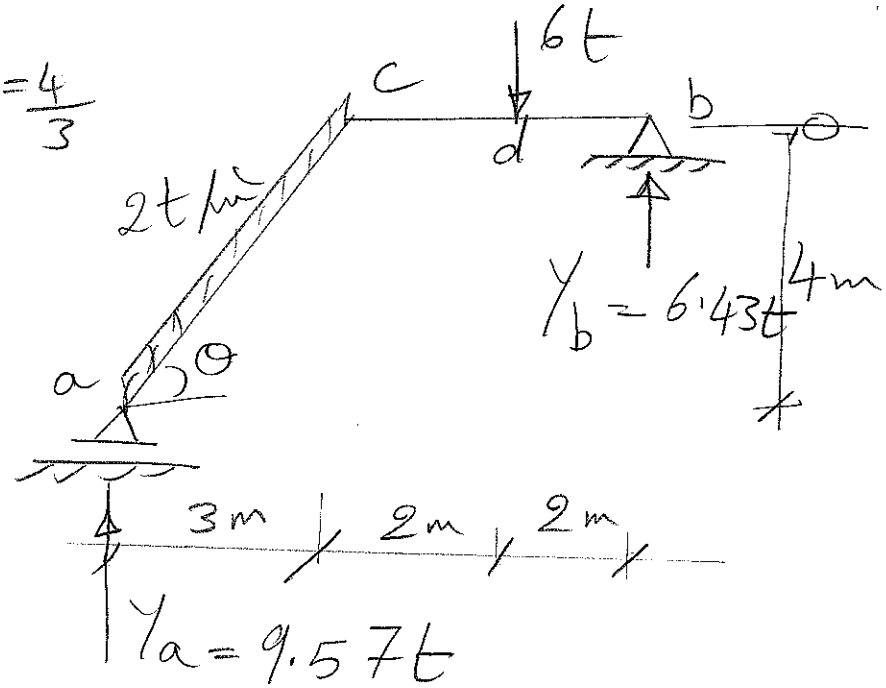
$= 36mt$

M_D left $= 36 + 5$

$= 41mt$

Q2

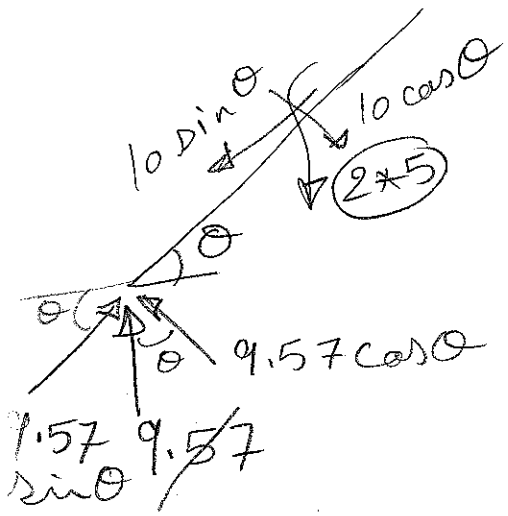
$\tan\theta = \frac{4}{3}$

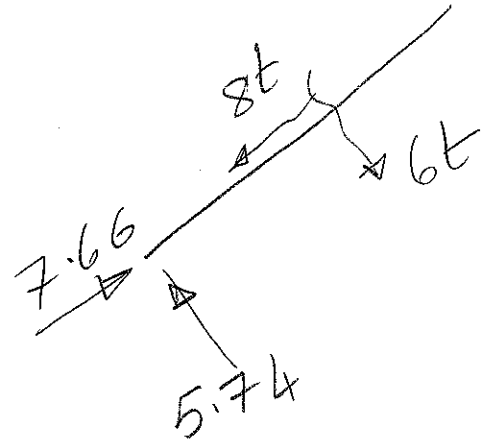


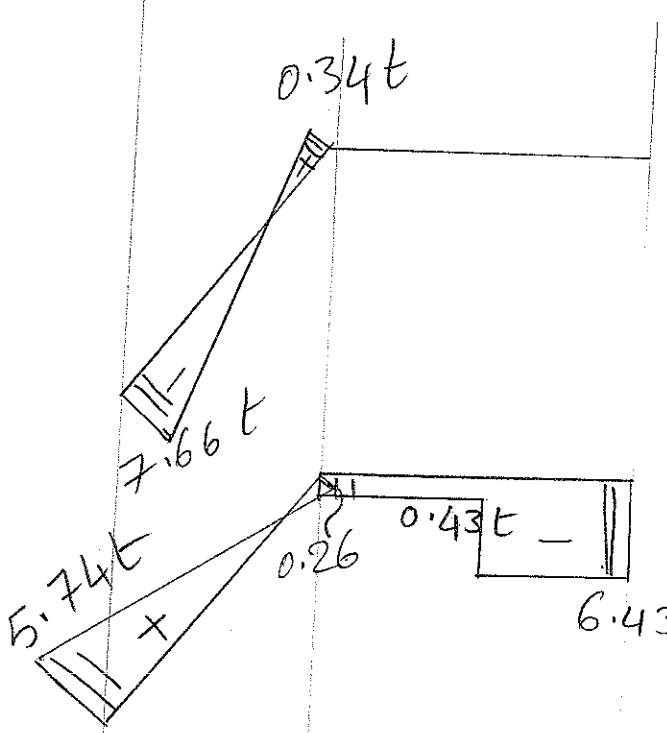
$\Sigma M@b = 0$

$6*2 + 2*5*5.5 - 7Y_a = 0$

$\therefore Y_a = 9.57t$

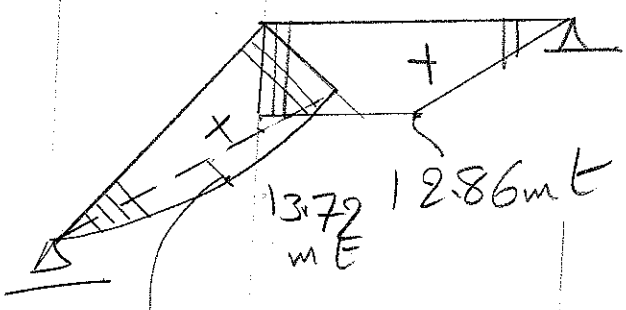






N.F.D.

S.F.D.

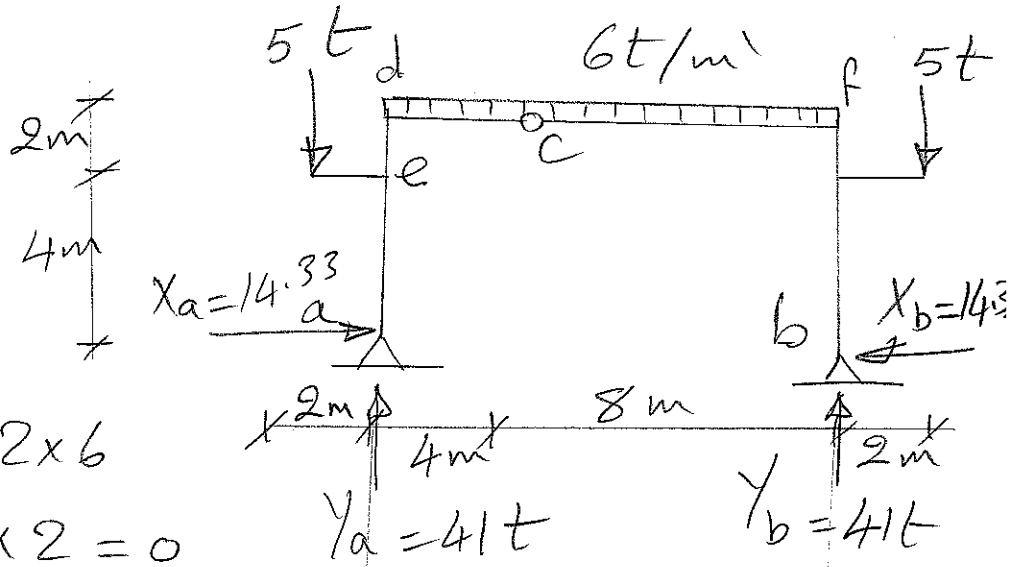


B.M.D.

$M_C = 6.43 \times 4 - 6 \times 2$

$\frac{2(5)(3)}{8} = 3.75$

Q3



$\Sigma M @ b = 0$

$5 \times 14 + 6 \times 12 \times 6 - 12 Y_a - 5 \times 2 = 0$

$\therefore Y_a = 41\,t$

$\Sigma M @ c_{right} = 0$

$6 \times 8 \times 4 + 5 \times 10 + 6 X_b - 41 \times 8 = 0$

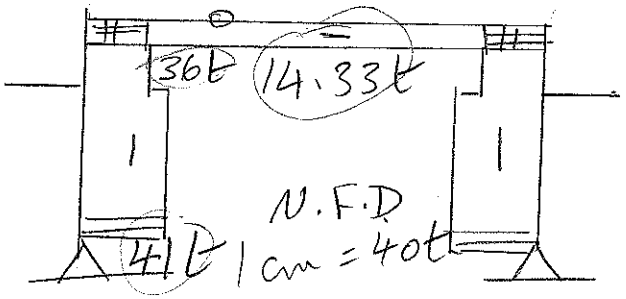
$\therefore X_b = 14.33\,t$

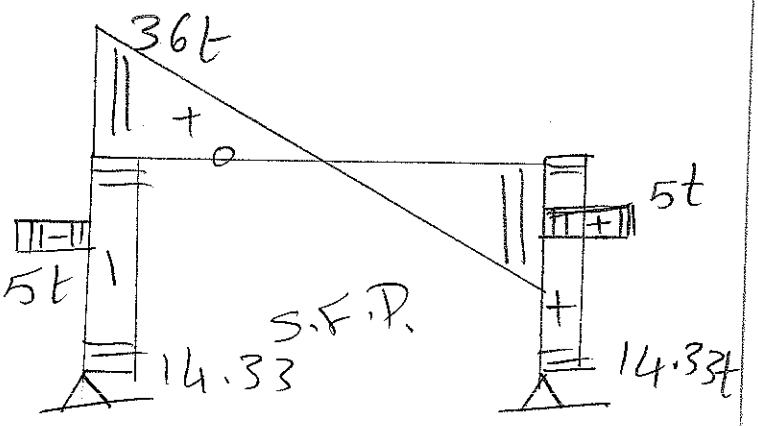
check

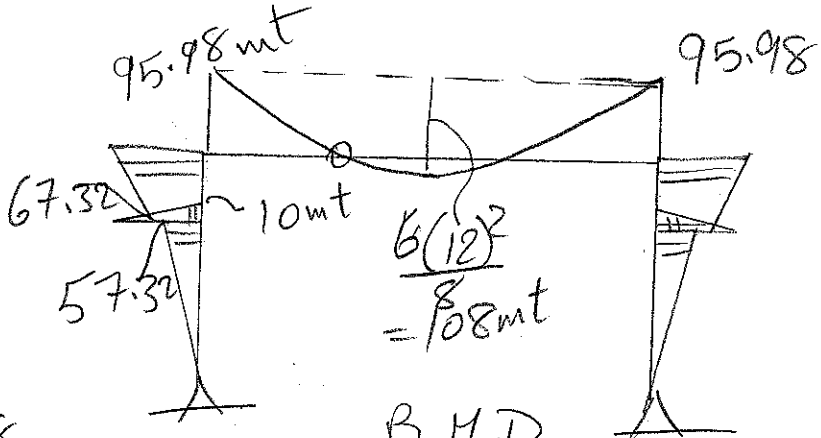
$\Sigma M @ c_{left} = 0$

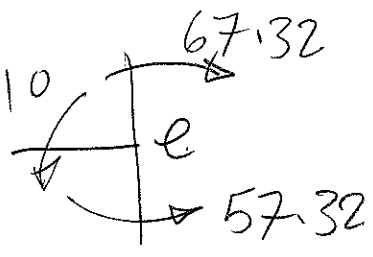
$6 \times 4 \times 2 + 5 \times 6 + 6 X_a - 41 \times 4 = 0$

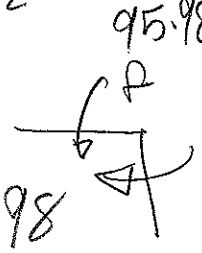
$\therefore X_a = 14.33\,t$









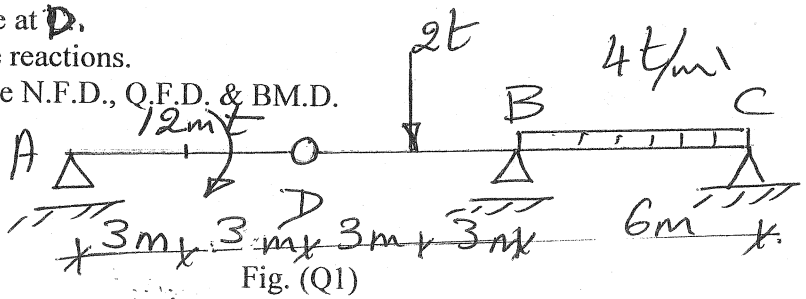
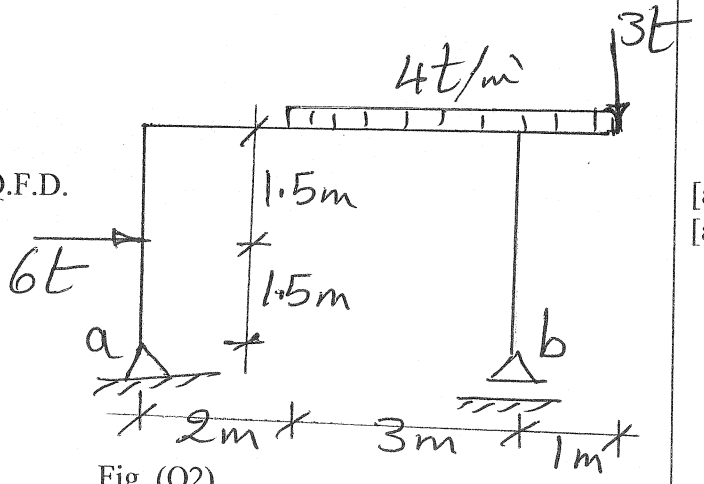
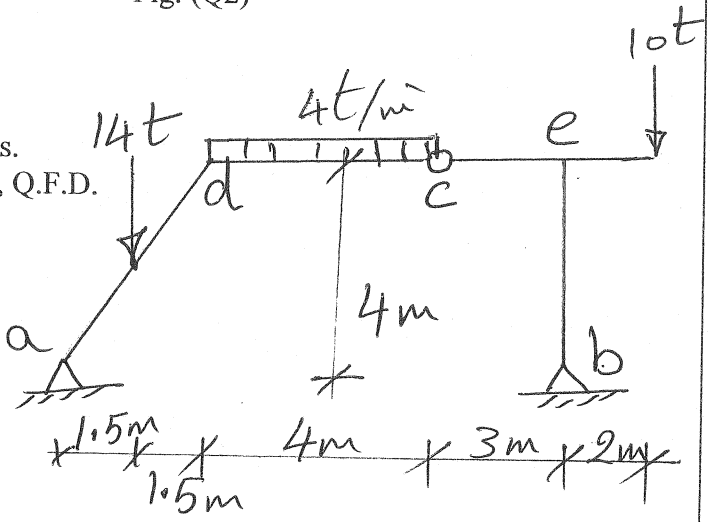
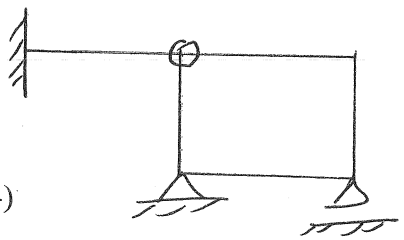


$M_e = 14.33 \times 6 + 5 \times 2 = 95.98$

Higher Technological Institute — Civil Eng. Department

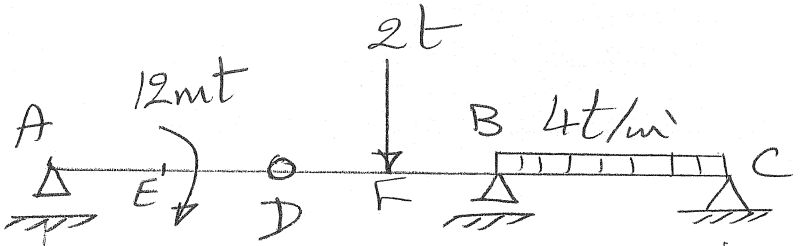
Mid-Term Exam – (Sep-Dec 2017)
Theory of Structures (2)-CT 112

Dr.Manal Kamal Zaki — G 93 — Time: $1\frac{1}{2}$ hrs.

	ILO's	
Q1		
For the shown beam: 1. Separate at D. 2. Find the reactions. 3. Draw the N.F.D., Q.F.D. & BM.D.	[a2] [a2] [a2,b3,c2]	[2 marks] [2 marks] [4 marks]
 Fig. (Q1)		
		[Total 8]
Q2		
For the shown Frame: 1. Find the reactions. 2. Draw the N.F.D., Q.F.D. 3. Draw B.M.D.	[a2] [a2,b3,c2] [a2,b3,c2]	[2 marks] [4 marks] [4 marks]
 Fig. (Q2)		
		[Total 10]
Q3		
For the shown Frame: 4. Find the reactions. 5. Draw the N.F.D., Q.F.D. 6. Draw B.M.D.	[a1] [a2,b3,c2] [a2,b3,c2]	[2 marks] [4 marks] [4 marks]
 Fig. (Q3)		
		[Total 10]
Q4		
Discuss the stability and determinacy of the shown structure:	[b1,c1]	[2 marks]
 Fig. (Q4)		
		[Total 2]
		[Total 30]

Mail:

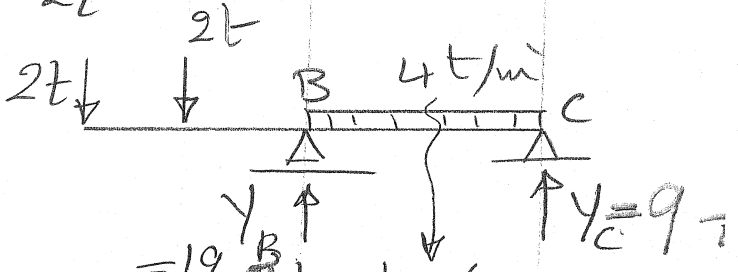
Q1



① $\Sigma M@C = 0$

$2\times12 + 2\times9 + 4\times6\times3 - 6Y_B = 0$

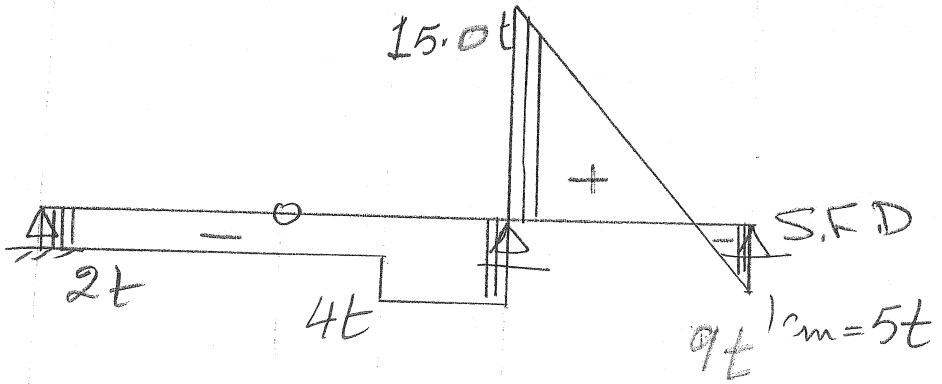
$\therefore Y_B = 19.0\ t$



② $\Sigma F_y = 0$

$2 + 2 + 4\times6 - 19.0 - Y_C = 0$

$\therefore Y_C = 9.0\ t$



$M_E = -2\times3 = -6\ tm$

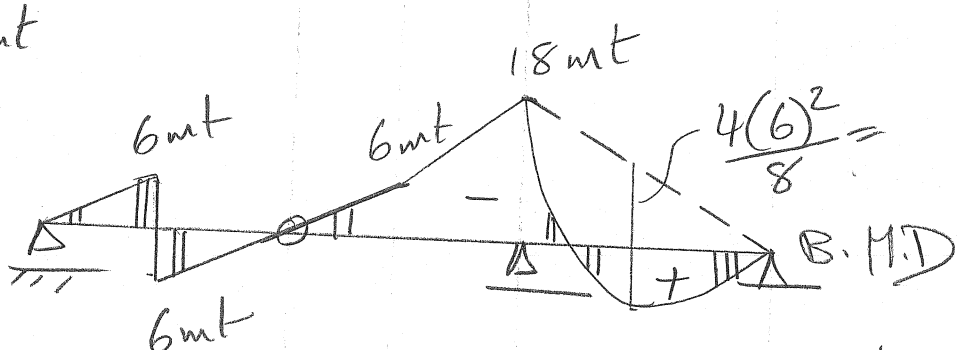
6ft

$M_{ER} = -6 + 12 = +6mt$

$M_F = -2\times3 = -6mt$

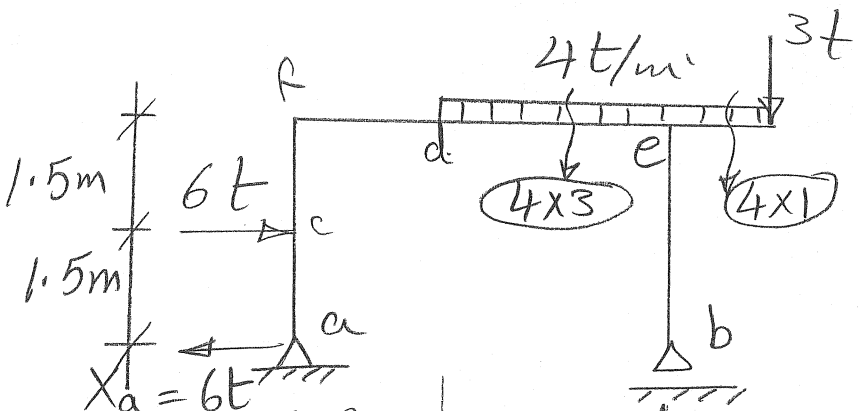
$M_B = -2\times6 - 2\times3$

$= -18mt$



10mt
= 1cm

Q2



$\Phi \Sigma M @ a = 0$

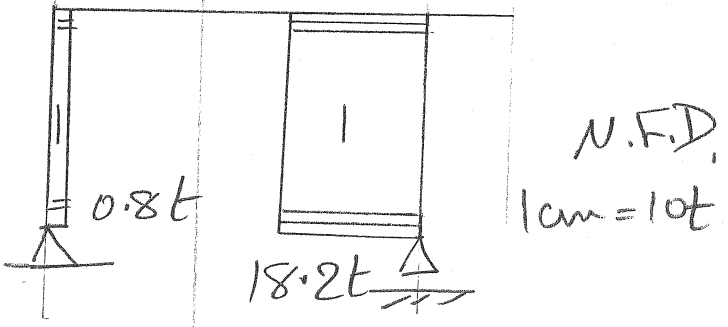
$6 \times 1.5 + 4 \times 4 \times 4 + 3 \times 6 - 5 Y_b = 0$

$\therefore Y_b = 18.2\,t$

$\Sigma F_y = 0$

$\therefore Y_a + 18.2 - 4 \times 4 - 3 = 0$

$\therefore Y_a = 0.8\,t$

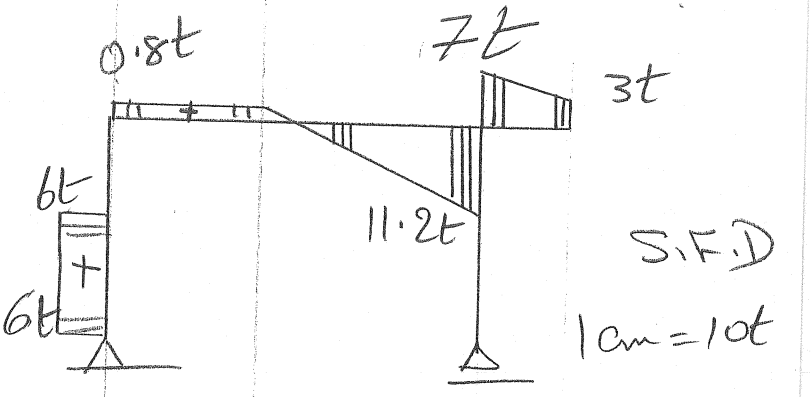


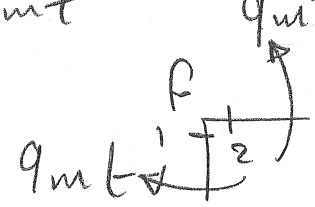
$M_c = 6 \times 1.5 = 9\,mt$

$M_{f_1} = 6 \times 3 - 6 \times 1.5 = 9\,mt$

$M_d = 0.8 \times 2 + 6 \times 3 - 6 \times 1.5$

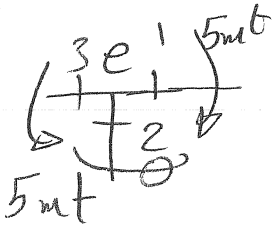
$= 10.6\,mt$

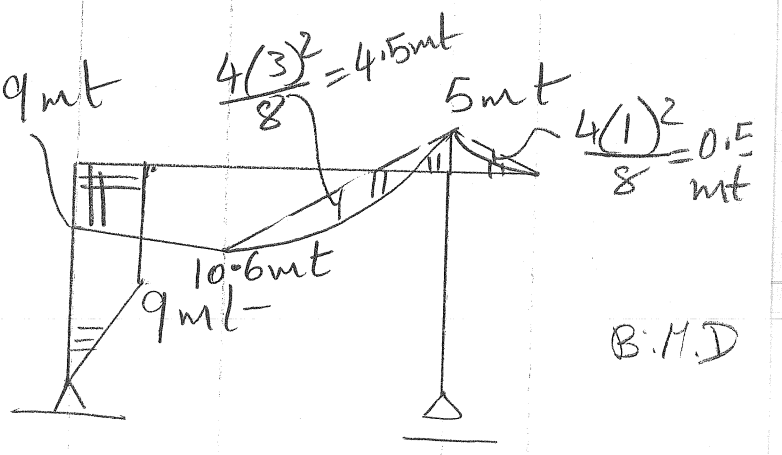




$M_{e_1} = -3 \times 1 - 4 \times 1 \times 0.5$

$M_{e_1} = -5\,mt$



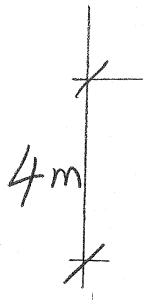


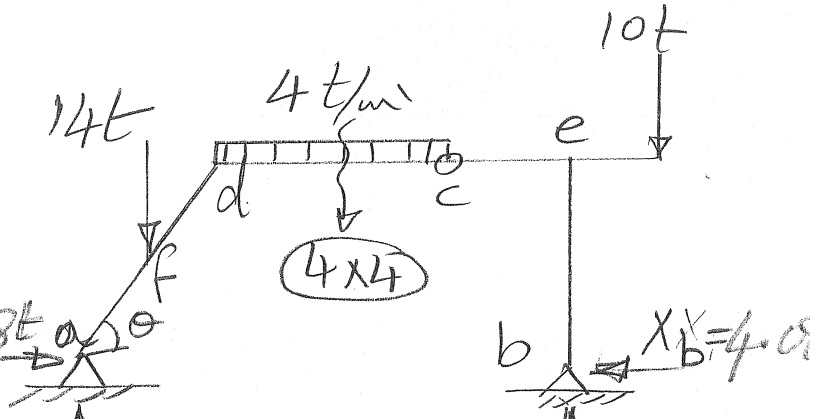
Q3

$\tan\theta = \frac{4}{3}$

$\sin\theta = 0.8$

$\cos\theta = 0.6$





① $\Sigma M_{@a} = 0$

$14 \times 1.5 + 4 \times 4 \times 5 - 10 Y_b + 10 \times 12 = 0$

$\therefore Y_b = 22.1$

② $\Sigma F_y = 0$

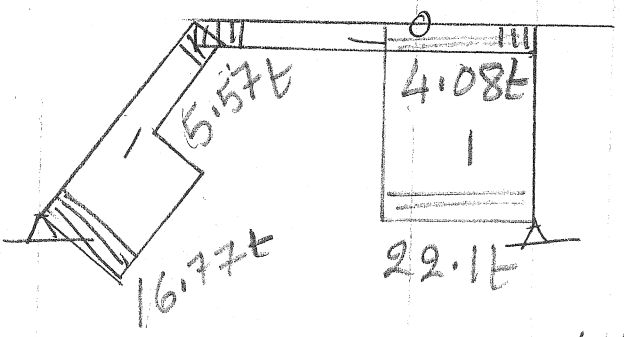
$-14 - 4 \times 4 - 10 + Y_a + Y_b = 0$

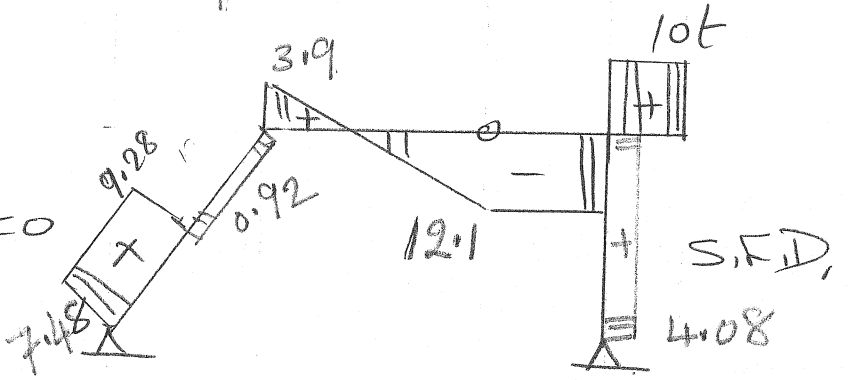
$\therefore Y_a = 17.9t$

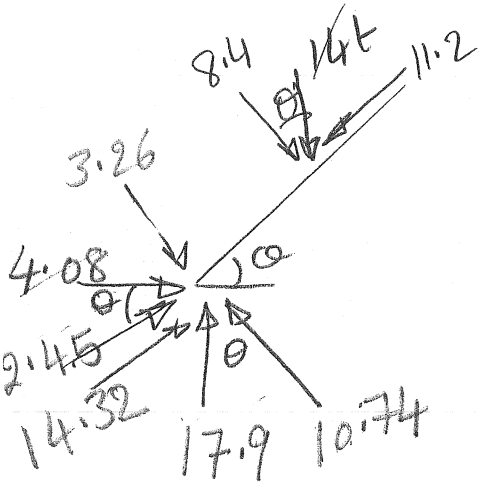
③ $\Sigma M_{cR} = 0$

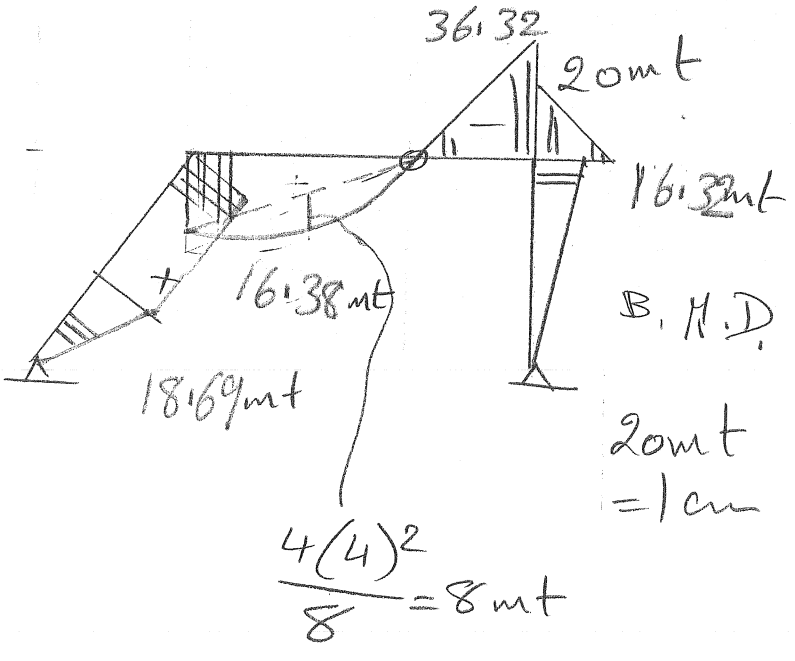
$10 \times 5 + 4 X_b - 22.1 \times 3 = 0$

$\therefore X_b = 4.08$

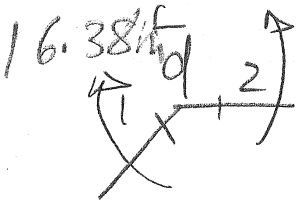




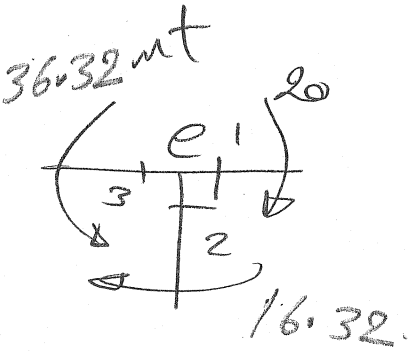




$$M_f = 17.9 \times 1.5 - 4.08 \times 2$$
$$= 18.69 \text{ mt}$$

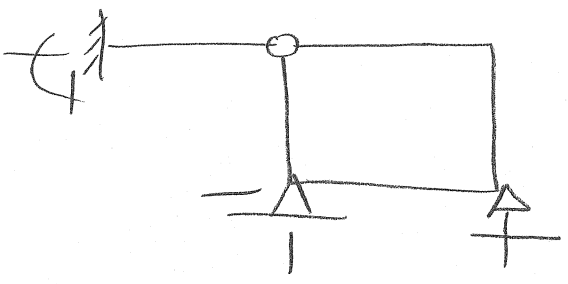


$$M_{e_1} = -10 \times 2 = -20 \text{ mt}$$
$$M_{e_2} = -4.08 \times 4 = -16.32 \text{ mt}$$



$$M_{d_1} = -4.08 \times 4 - 14 \times 1.5 + 17.9 \times 3$$
$$= 16.38 \text{ mt}$$

Q4



$$U = 6 + 3 = 9$$

$$E = 3 + (3-1) = 5$$

∴ Stable & 4 times st. indet.

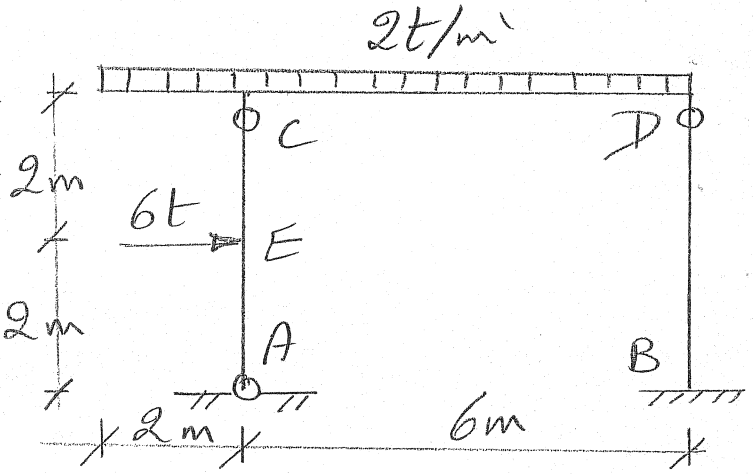
Higher Technological Institute
10th Ramadan City
(6th October Branch)
Department of Civil Engineering

Course :Theory of Structures(2) (CT 112) **Term : Jan.-May 2018**
Examiner: Dr.Manal Kamal Zaki **Time : 90 min**

Final Exam

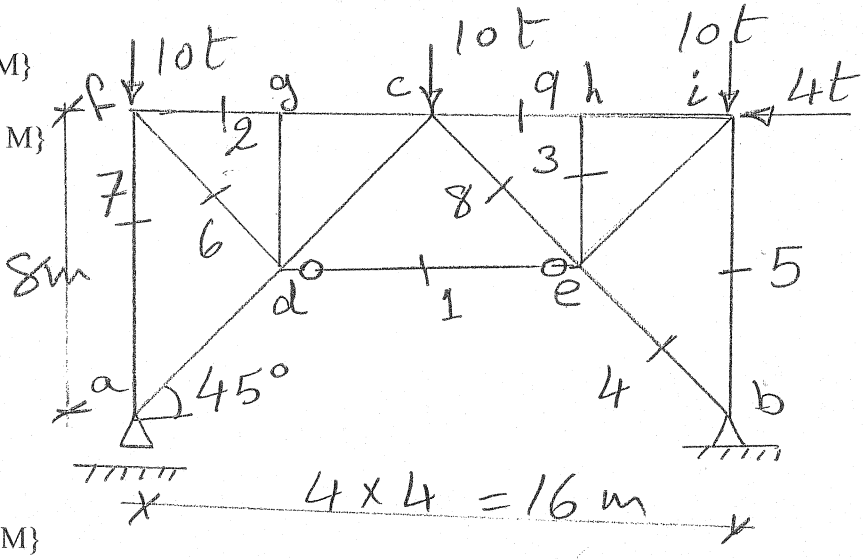
Question 1 {16 Marks}
For the shown frame:

1. Find the reactions. [a2] {4 M}
2. Draw the N.F.D., Q.F.D. [a2,b3,c2] {8 M}
3. Draw the B.M.D. [a2,b3,c2] {4 M}



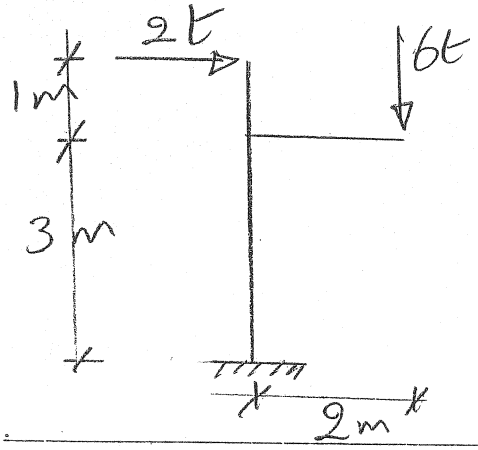
Question 2 {12 Marks}
For the shown truss:

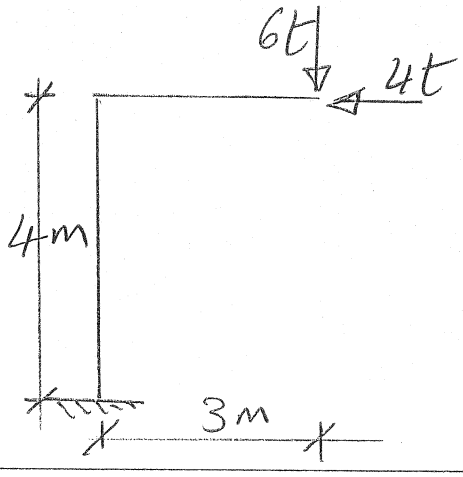
1. Find the reactions. [a2] {3M}
2. Find the normal forces in the marked members [a3,b3,c3] {9 M}

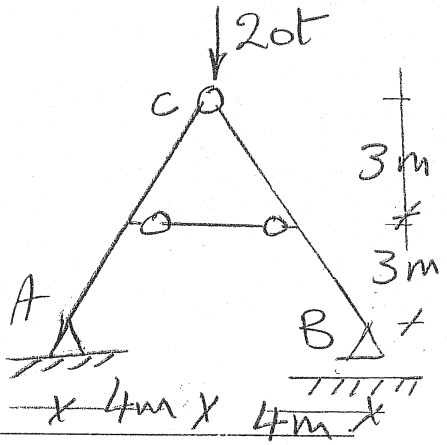


Question 3 {12 Marks}
For the shown structures:

1. Find the forces in the link members.
2. Draw the B.M.D. only [a2,a4,c4] {12 M}







Examination committee: 1-Name Signature
2-Name Signature

Q1

① $\Sigma M @ C_{lower} = 0$

$6 \times 2 - X_a * 4 = 0$

$\therefore X_a = 3t$

② $\Sigma F_x = 0$

$\therefore 6 - 3 - X_B = 0$

$\therefore X_B = 3t$

③ $\Sigma M @ D_{lower} = 0$

$3 \times 4 - M_B = 0$

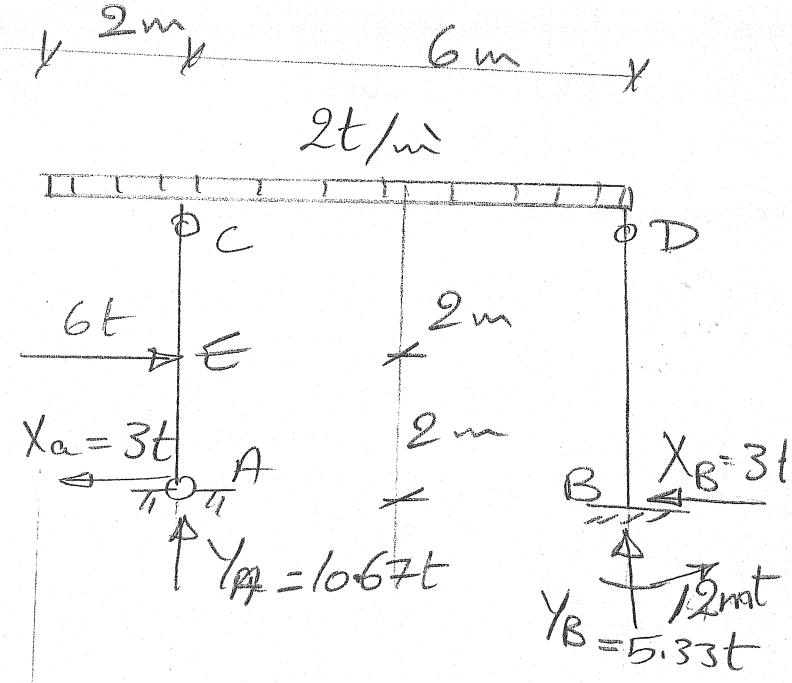
$\therefore M_B = 12 mt$

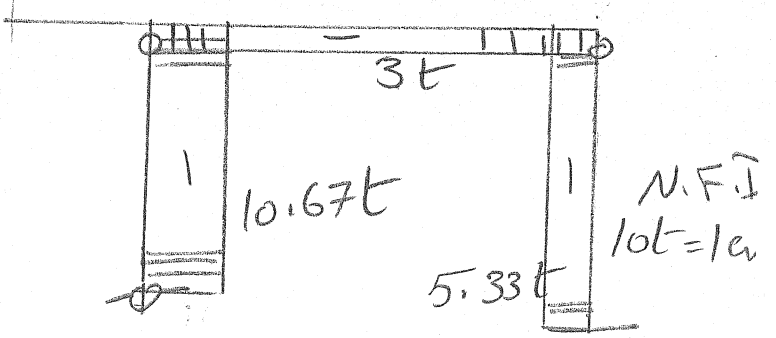
④ $\Sigma M @ A = 0$

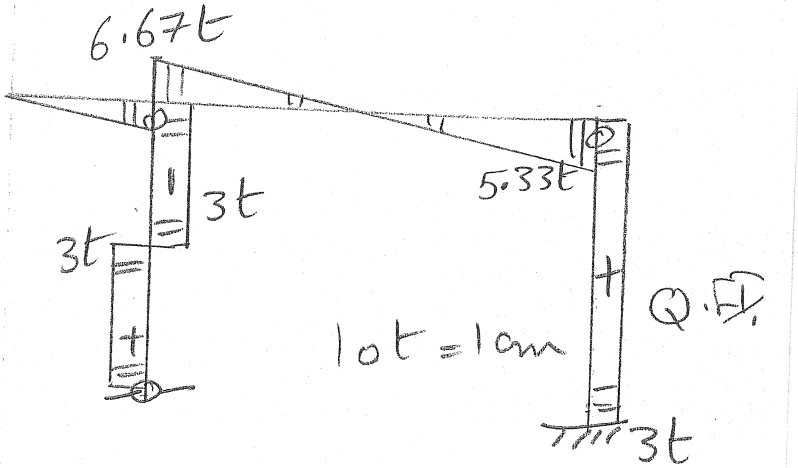
$6 * 2 + 2 * 8 * 2 - 12 - 6 Y_B = 0$

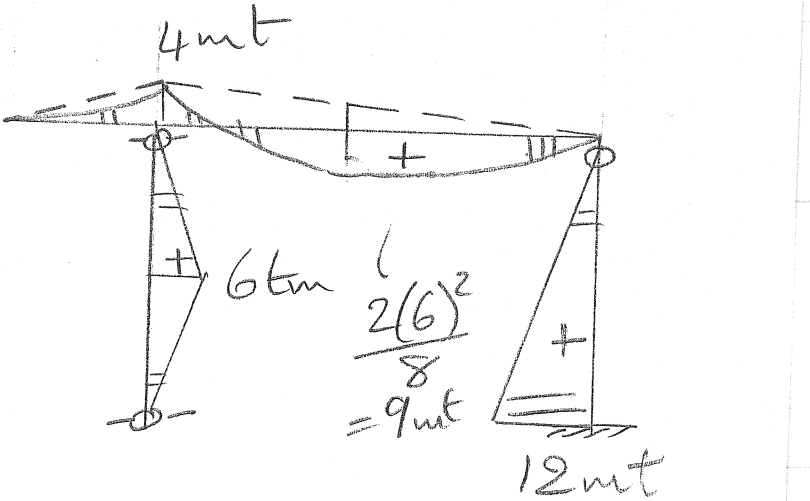
$\therefore Y_B = 5.33t$

$M_E = 3 \times 2 = 6 mt$

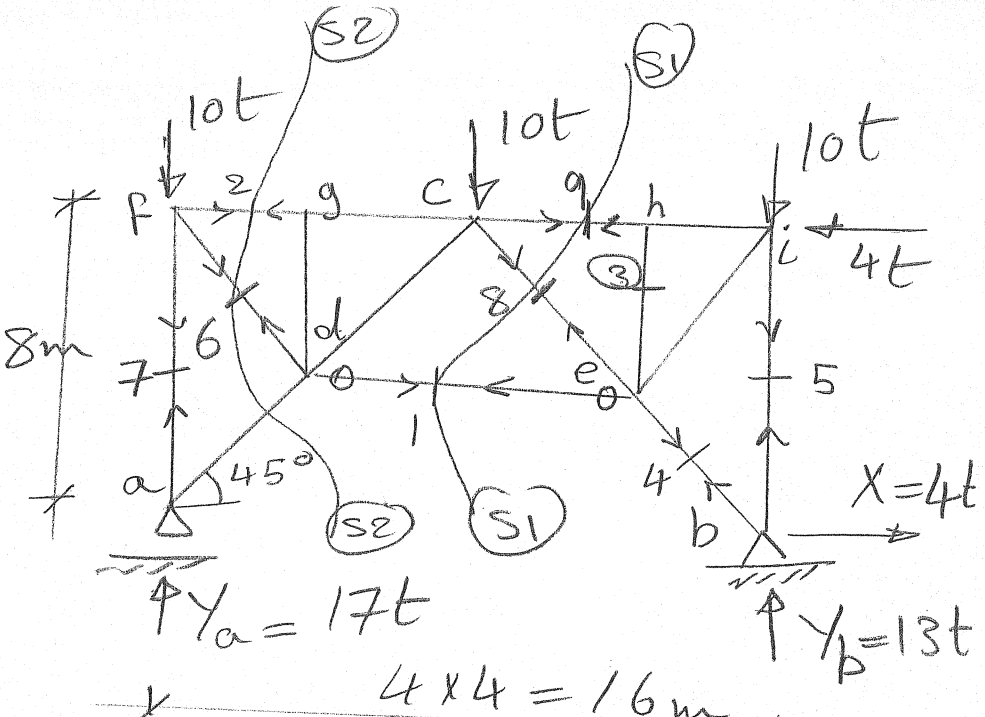








Q2



$\Sigma M @ a = 0$

$10 \times 8 + 10 \times 16 - 4 \times 8 - 16 Y_b = 0$

$Y_B = 13t$

Sec S1-S1 $\quad \Sigma M @ c \text{ left} = 0$

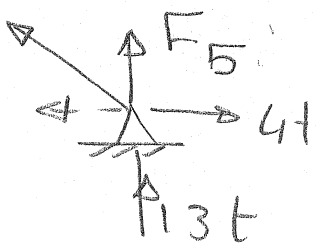
$(17-10) * 8 - F_1 * 4 = 0 \quad \therefore \boxed{F_1 = +14t}$ tens.

Sec S2-S2 $\quad \Sigma M @ d \text{ left} = 0$

$(17-10) * 4 - F_2 * 4 = 0 \quad \therefore \boxed{F_2 = -7t}$ comp.

Joint h $\quad \Sigma F_y = 0 \quad \therefore \boxed{F_3 = 0}$

Joint b $\quad \Sigma F_{xc} = 0$

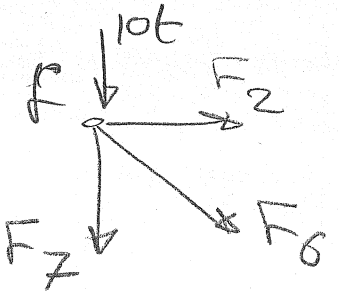


$\therefore -F_4 \cos 45 - 4 = 0 \quad \therefore \boxed{F_4 = +5.65}$ tens

$\Sigma F_y = 0 \therefore F_4 \sin 45 + F_5 + 13 = 0$

$\therefore \boxed{F_5 = -17t}$ comp

Joint f : $\Sigma F_x = 0$



$F_2 + F_6 \cos 45 = 0$

$\therefore F_2 = -7t$

$\therefore \boxed{F_6 = +9.9\,t}$ tens

$\Sigma F_y = 0$

$\therefore 10 + F_7 + F_6 \sin 45 = 0$

$10 + F_7 + 9.9 \sin 45 = 0$

$\therefore \boxed{F_7 = -17\,t}$ comp.

Sec s1–s1' : $\Sigma F_{y,t} = 0$

$13 - 10 + F_8 \sin 45 = 0$

$\therefore \boxed{F_8 = -4.24\,t}$ comp

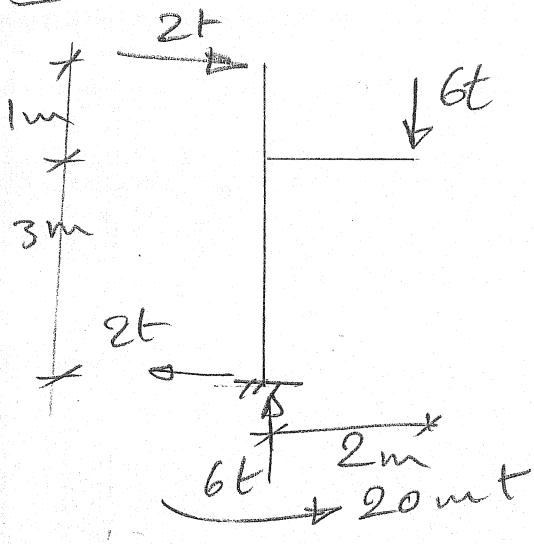
$\Sigma F_{x,t} = 0$

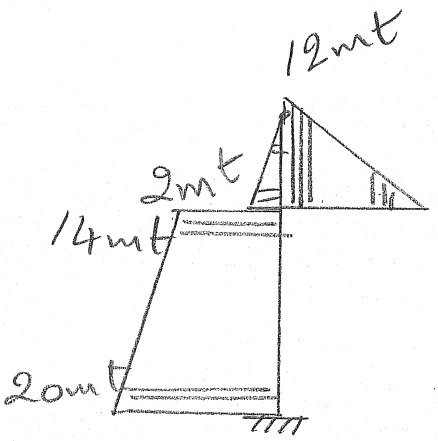
$4 - 4 - F_9 - F_1 - F_8 \cos 45 = 0$

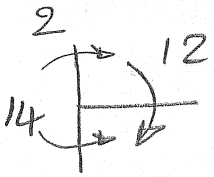
$\therefore -F_9 - 14 + 4.24 \cos 4 = 0$

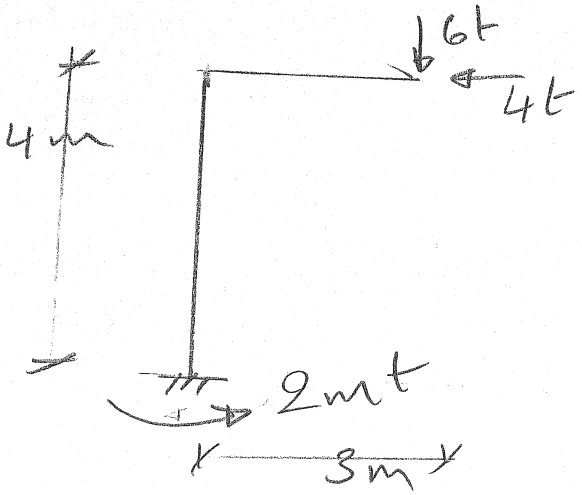
$\therefore \boxed{F_9 = -11\,t}$ comp

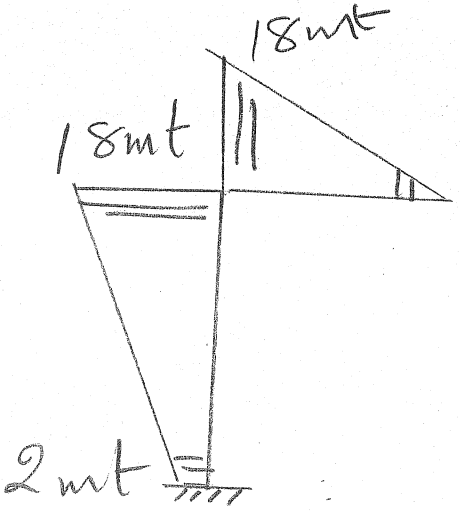
Q3

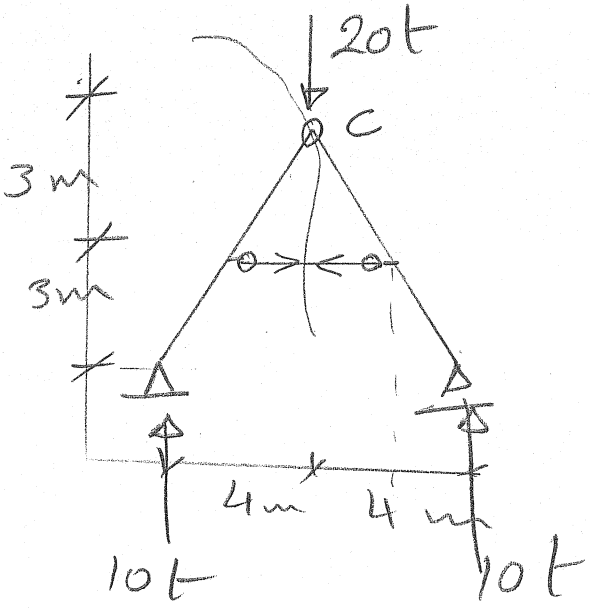


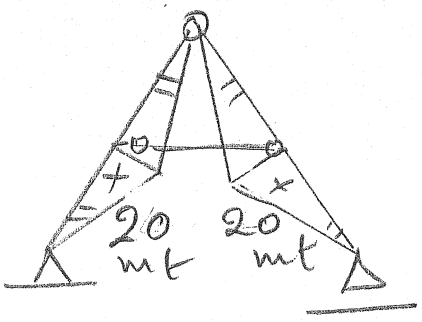












$\Sigma M_{@C\ left} = 0$

$3F - 10 \times 4 = 0$

$\therefore F = 13.33t$

10TH OF RAMADAN CITY

HIGHER TECHNOLOGICAL INSTITUTE

Higher Technological Institute — Struc. Eng. Department

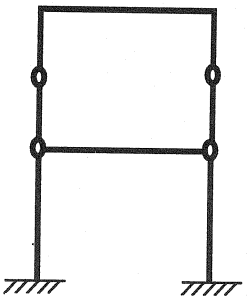
Model answer – (ThirdTerm 2016-2017)
Theory of structures (2)
CT 112

Dr.Hany Ibrahim Ahmed — Time: ساعة ونصف

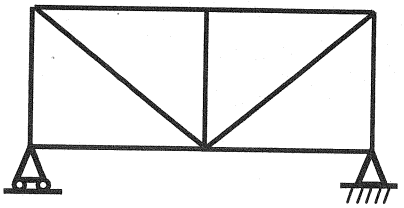
Q1Marks (12) **ILO's(a, b, and c)**

Check stability of the following structures:

Un stable

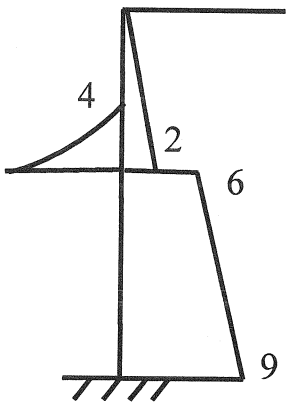


Un stable

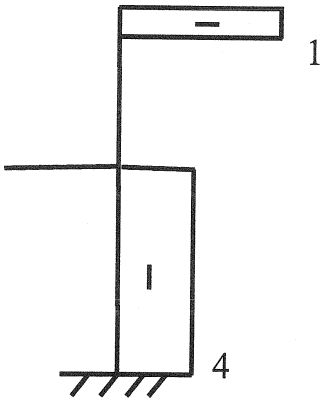


Stable & determinate

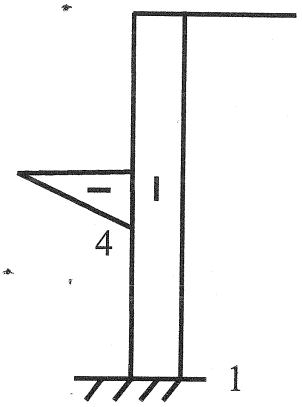
Q2Marks (18) **ILO's(a, b, and c)**



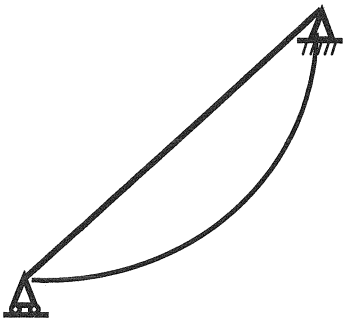
B.M.D



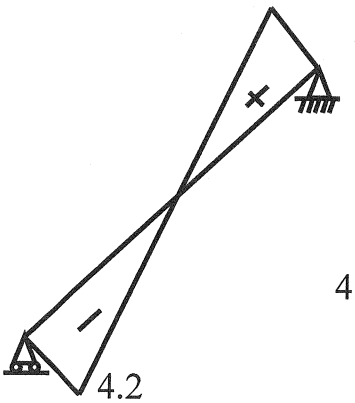
N.F.D



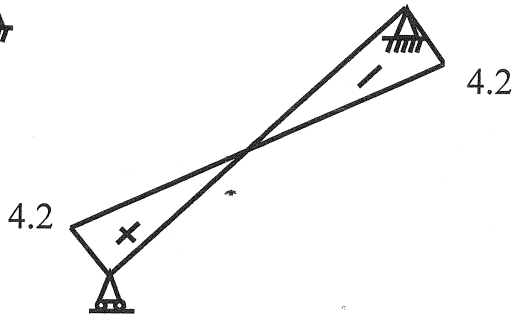
S.F.D



B.M.D



N.F.D



S.F.D

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Struc. Eng. Department

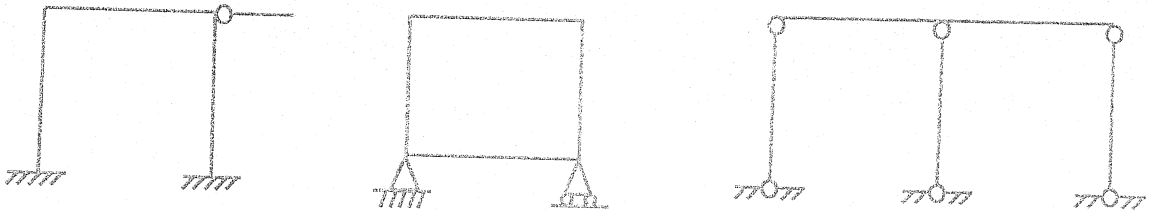
Final Exam – (Third Term 2016-2017)
Theory of structures (2)
CT 112

Dr. Hany Ibrahim Ahmed

Time: ساعة ونصف

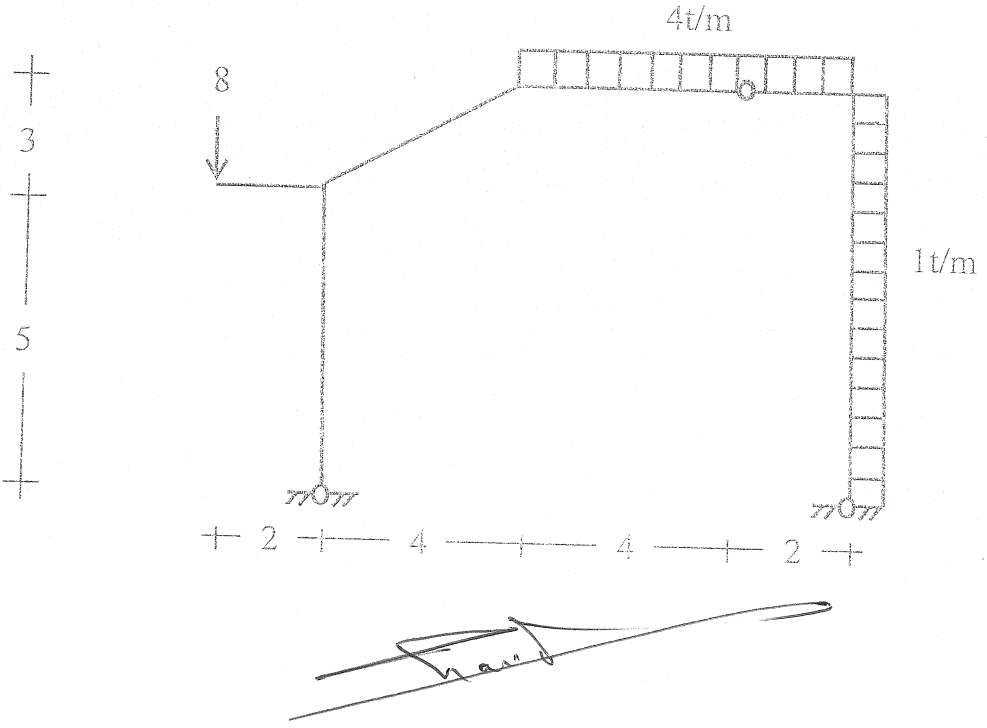
Q1Marks (12) **ILO's(a, b, and c)**

Check stability of the following structures:



Q2Marks (20) **ILO's(a, b, and c)**

Draw N.F.D , S.F.D, B.M.D for the following structures



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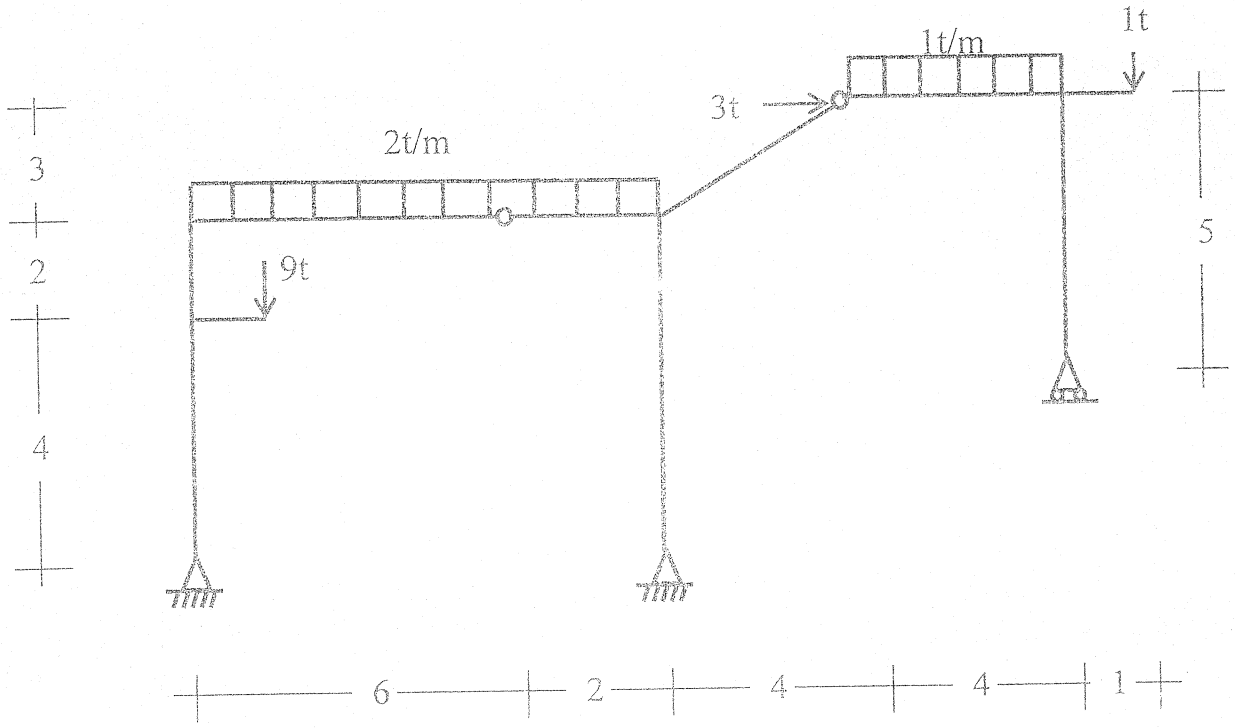
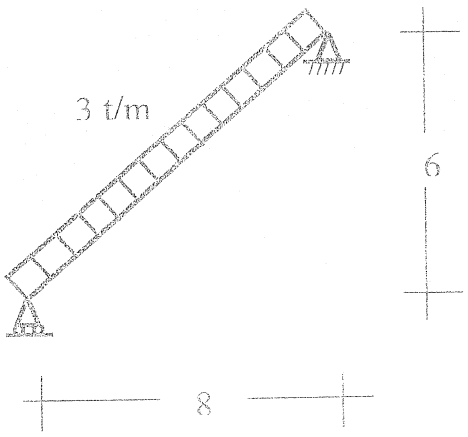
Final Exam – (Third Term 2016-2017)
Theory of structures (2)
CT 112

Dr. Hany Ibrahim Ahmed — Time: ساعة ونصف



Q3Marks (8) **ILO's(a, b, and c)**

Draw N.F.D , S.F.D, B.M.D for the following structure



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Struc. Eng. Department

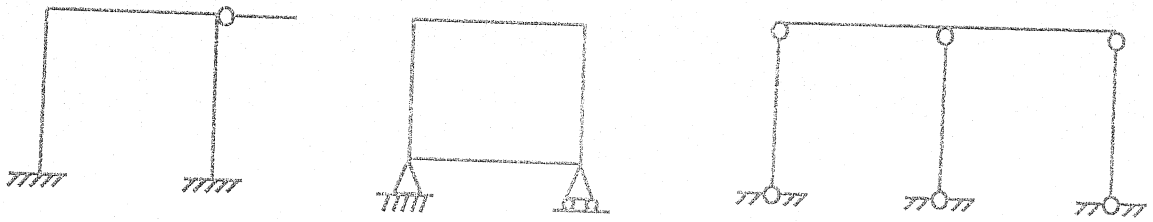
Final Exam – (Third Term 2016-2017)
Theory of structures (2)
CT 112

Dr. Hany Ibrahim Ahmed

Time: ساعة ونصف

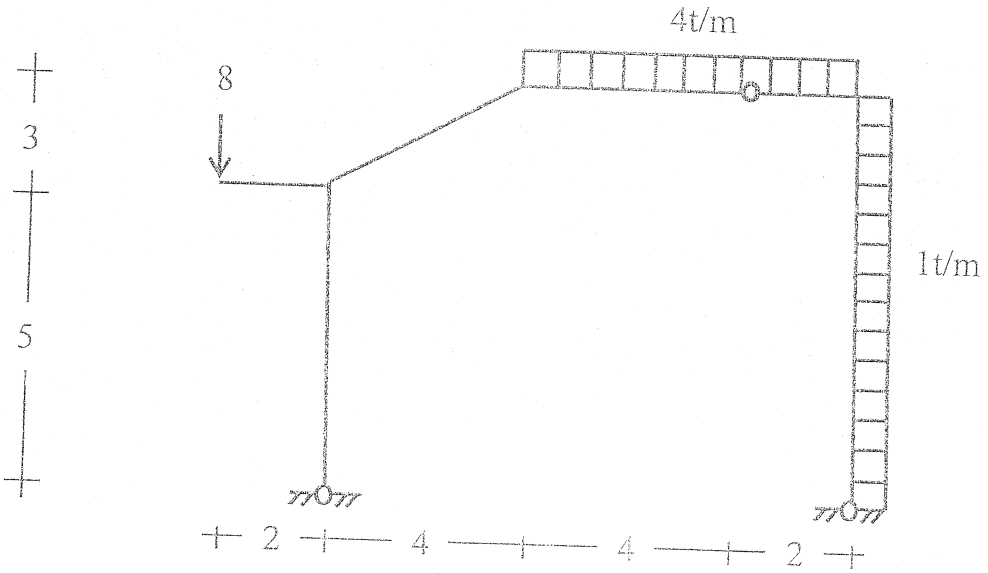
Q1Marks (12) **ILO's(a, b, and c)**

Check stability of the following structures:



Q2Marks (20) **ILO's(a, b, and c)**

Draw N.F.D , S.F.D, B.M.D for the following structures



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Theory of structures (2)
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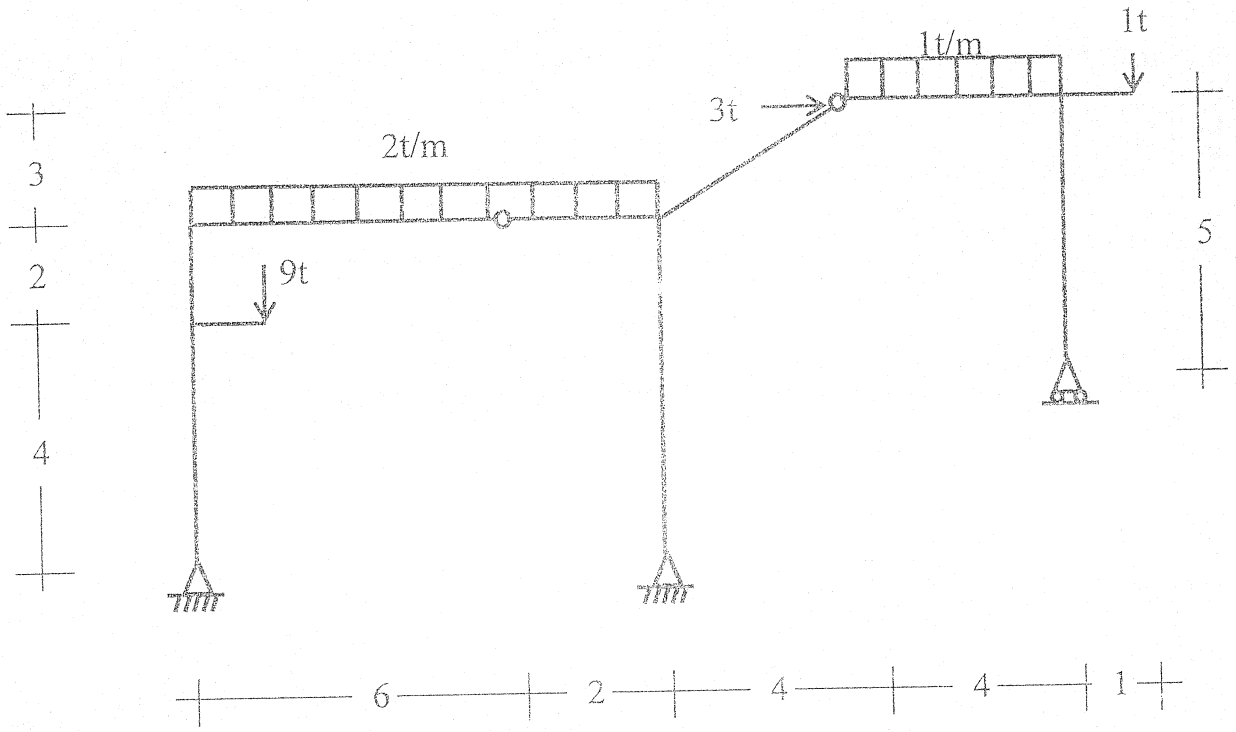
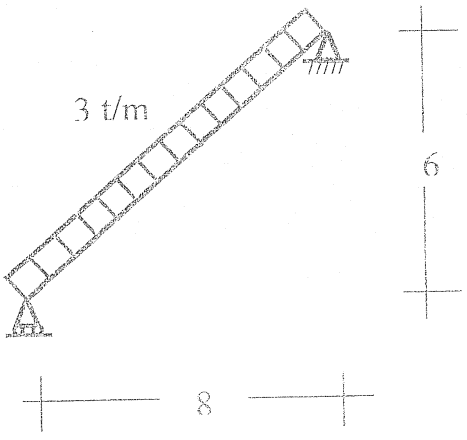


Q3Marks (8) ILO's(a, b, and c)

Draw N.F.D , S.F.D, B.M.D for the following structure



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Final Exam – (Third Term 2016-2017)
Theory of structures (2)
CT 112

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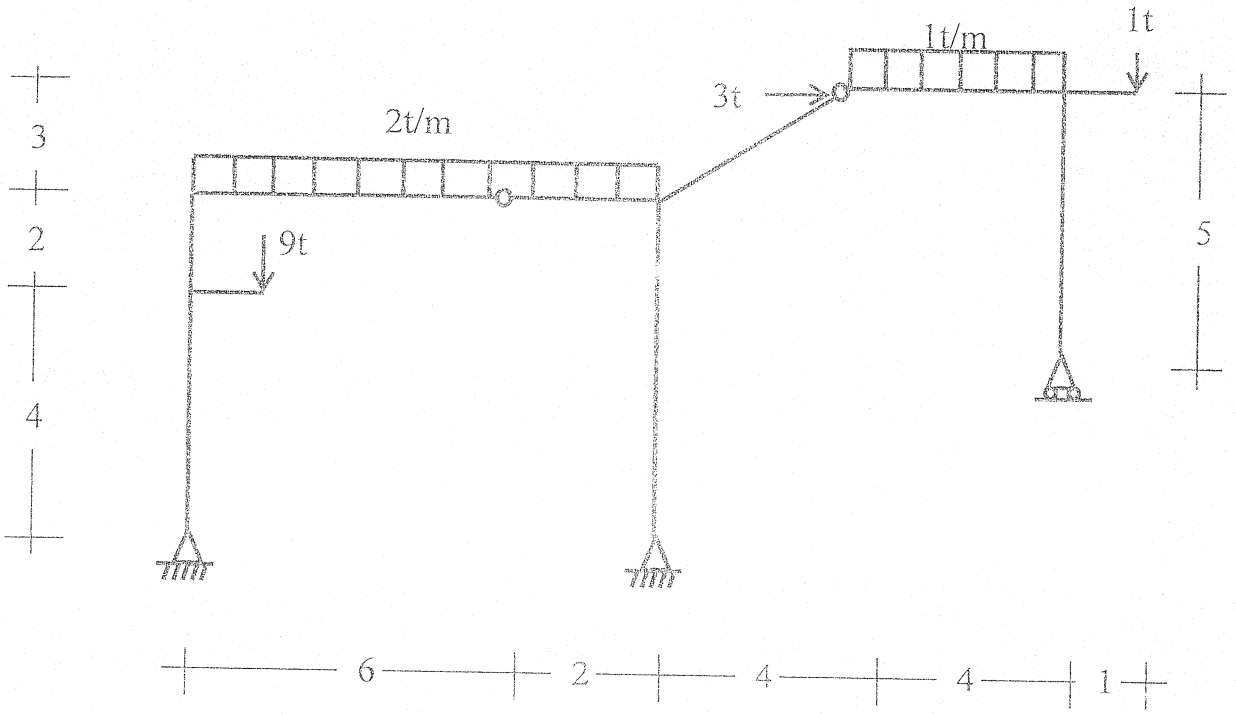
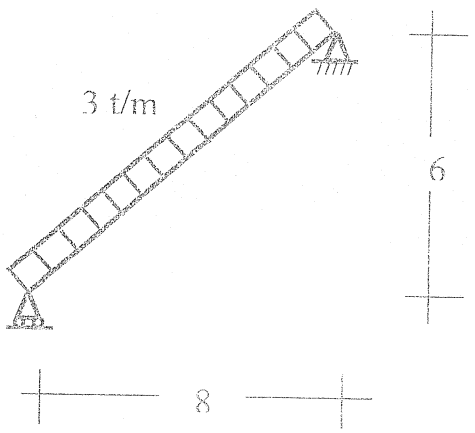
Time: ساعة ونصف



Q3Marks (8) **ILO's(a, b, and c)**

Draw N.F.D , S.F.D, B.M.D for the following structure



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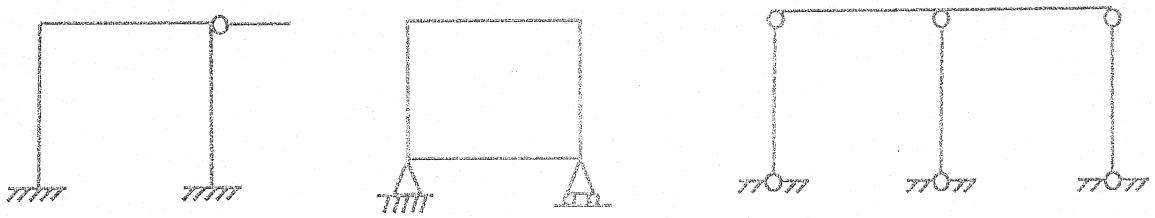
Higher Technological Institute — Struc. Eng. Department

Final Exam – (Third Term 2016-2017)
Theory of structures (2)
CT 112

Dr. Hany Ibrahim Ahmed — Time: ساعة ونصف

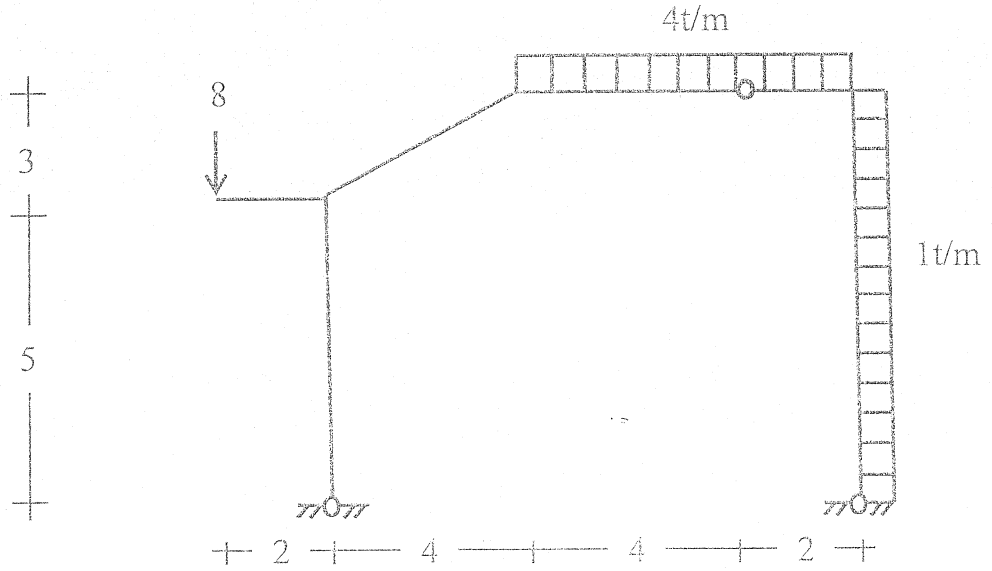
Q1Marks (12) ILO's(a, b, and c)

Check stability of the following structures:



Q2Marks (20) ILO's(a, b, and c)

Draw N.F.D , S.F.D, B.M.D for the following structures



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Struc. Eng. Department

Model answer – (final exam Third Term 2016-2017)

Theory of structures (2)

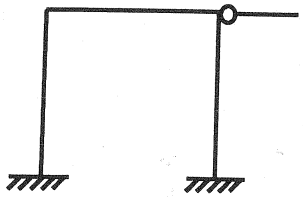
CT 112

Dr. Hany Ibrahim Ahmed

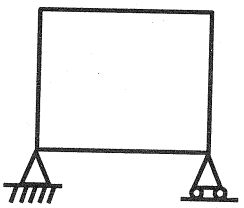
Time: ساعة ونصف

Q1Marks (12) **ILO's(a, b, and c)**

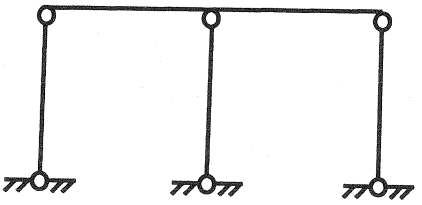
Check stability of the following structures:



Unstable



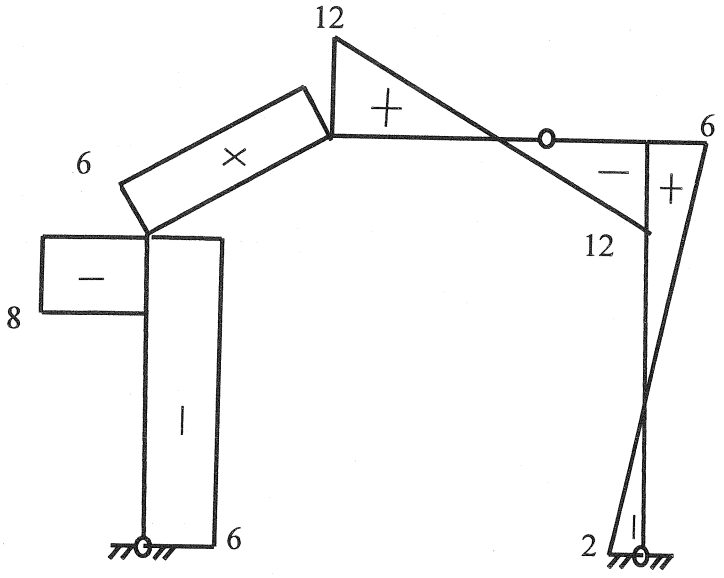
Stable and indeterminate (3 times)



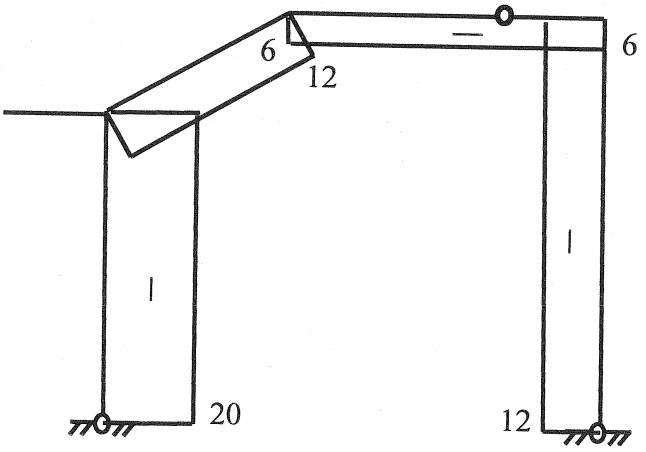
Unstable

Q2Marks (20) **ILO's(a, b, and c)**

Draw N.F.D , S.F.D, B.M.D for the following structures



S.F.D



N.F.D

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10TH OF RAMADAN CITY

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Higher Technological Institute

Struc. Eng. Department

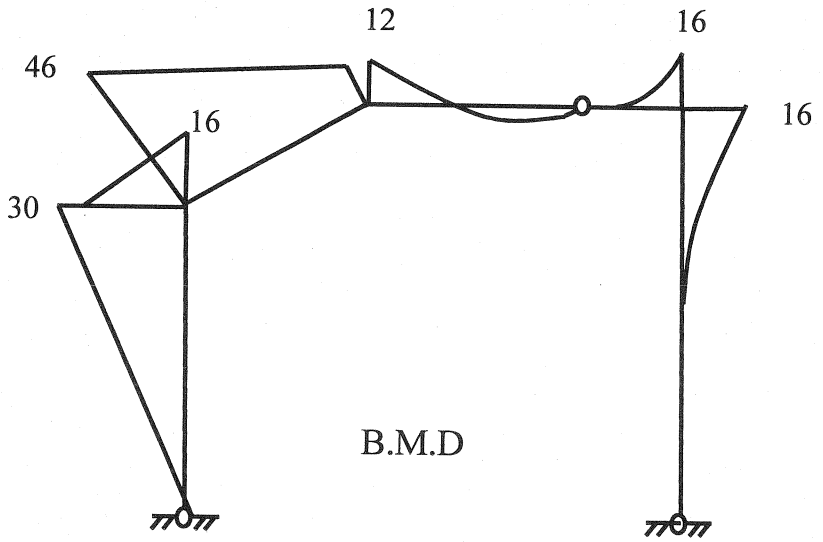
Model answer – (final exam Third Term 2016-2017)

Theory of structures (2)

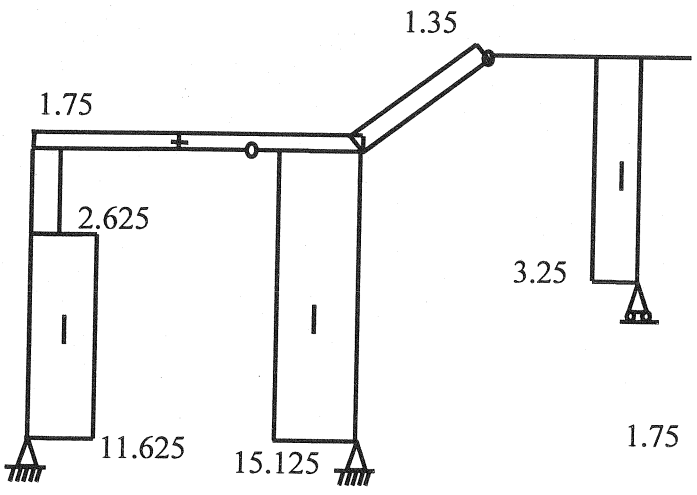
CT 112

Dr. Hany Ibrahim Ahmed

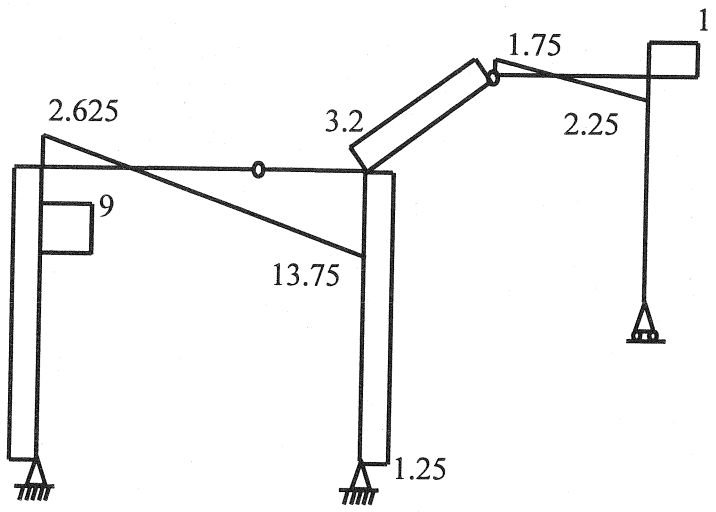
Time: ساعة ونصف



B.M.D



N.F.D



S.F.D

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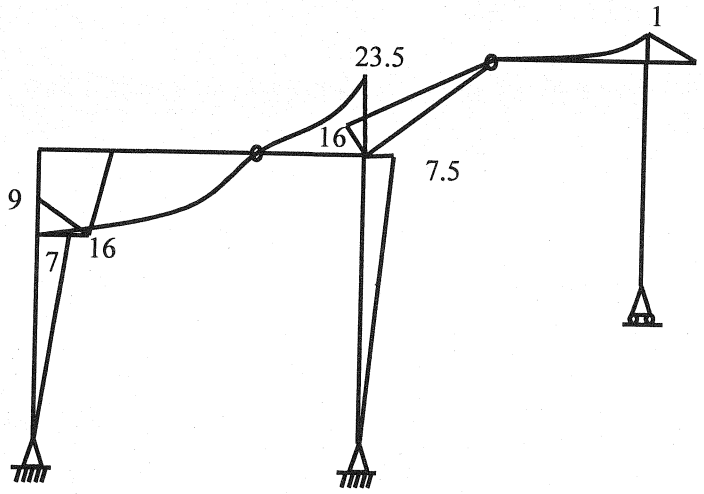
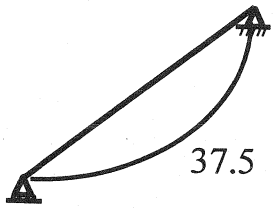
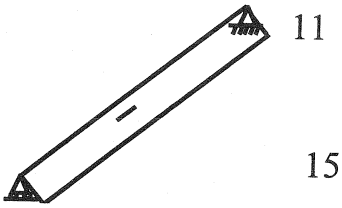


B.M.D

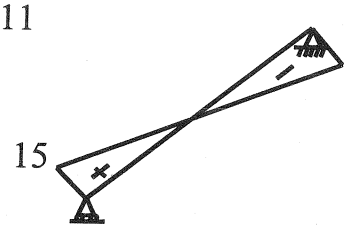
Q3Marks (8) **ILO's(a, b, and c)**



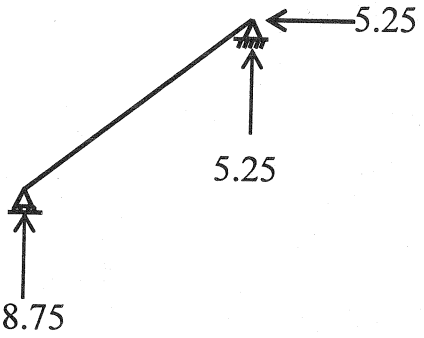
B.M.D

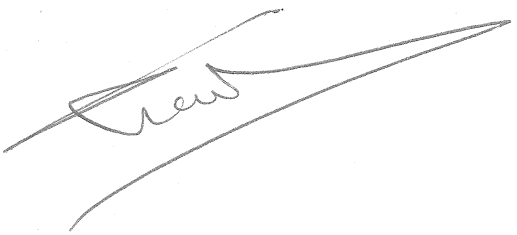


N.F.D



S.F.D





Higher Technological Institute
10th of Ramadan City
Department of Civil Engineering

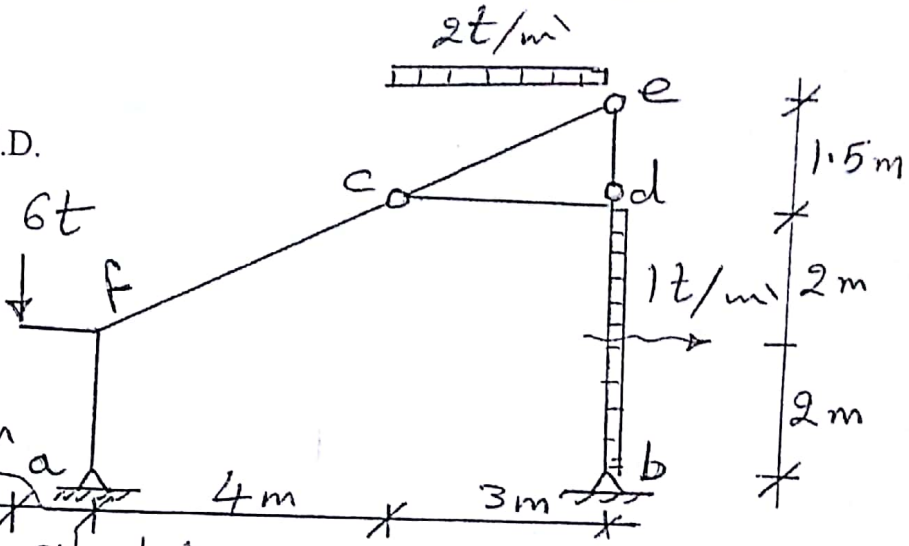
Subject: Structure 2 (CT 112)
Examiner: Examination Committee

Term: Jan.-May 2011
Time: 90 min

Final Examination

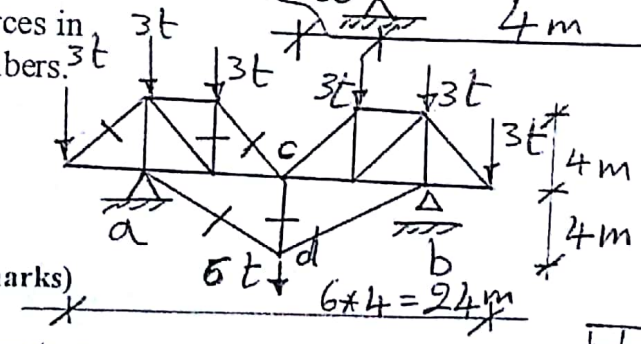
Question (1) (15 marks)

For the shown frame
- Draw the N.F.D., Q.F.D. and B.M.D.



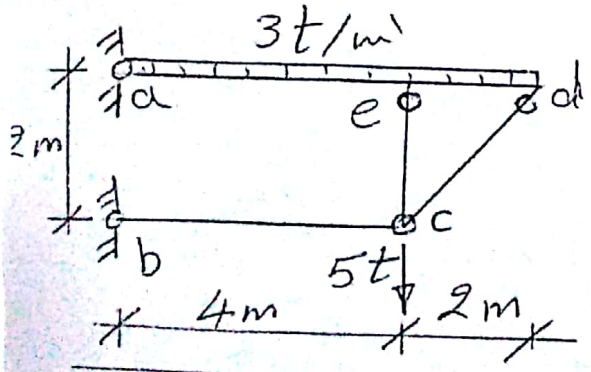
Question (2) (10 marks)

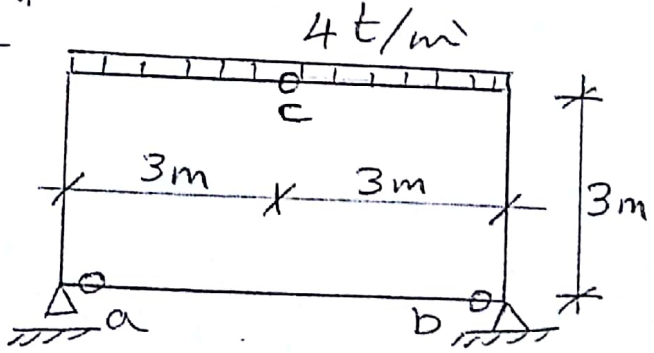
For the shown truss:
-compute the forces in the marked members.

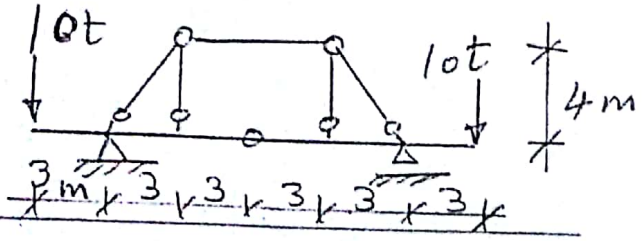


Question (3) (15 marks)

For the shown structures:
-Compute the forces in the link members.
-Draw the B.M.D. only.



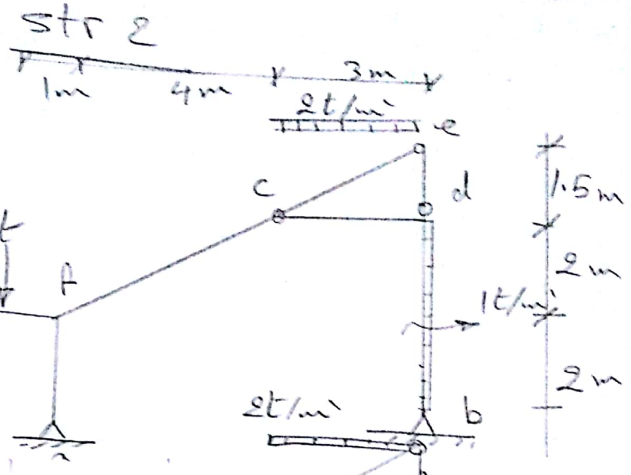




Coarse Examination Committee

Coarse Coordinator

Q1



$\Sigma M_a = 0$

$1 \times 2 + 2 + 3 \times 7 + 3 \times 4$

$- 6 \times 1 - y_b \times 7 = 0$

$\therefore y_b = 5t$

$\Sigma Y = 0$

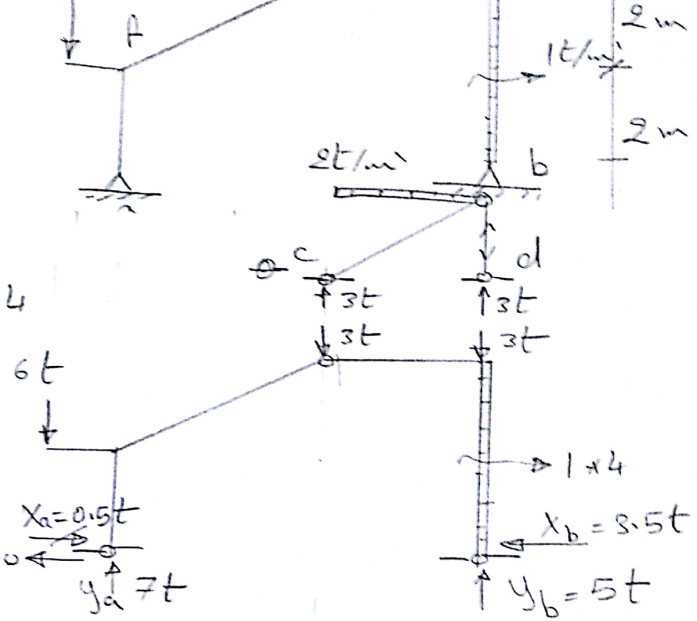
$\therefore 6 + 3 + 3 - y_b - y_a = 0$

$\therefore y_a = 7t$

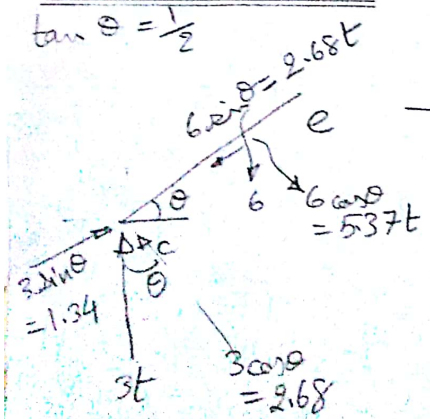
$\Sigma M @ c_{left} = 0$

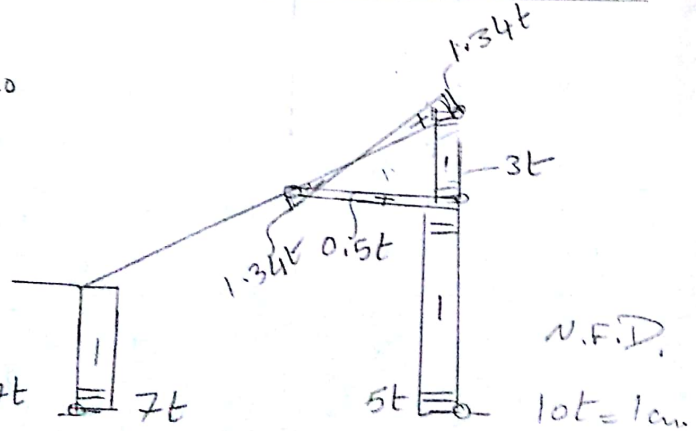
$-6 + 5 + 4X_a - 4y_b = 0$

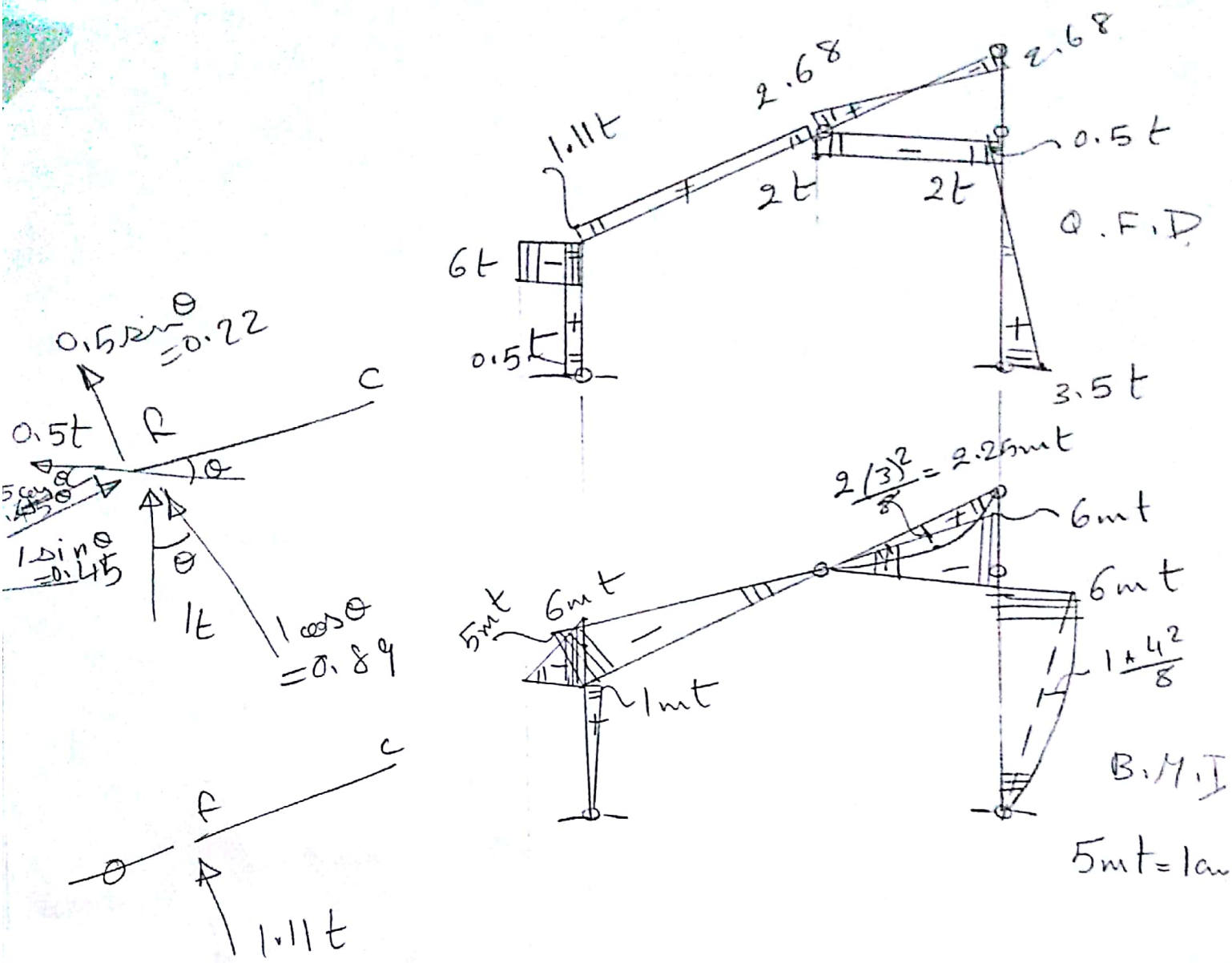
$\therefore X_a = -0.5t$

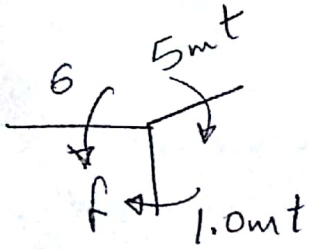


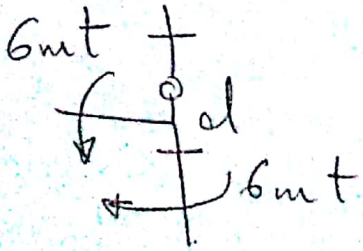
$\tan\theta = \frac{1}{2}$







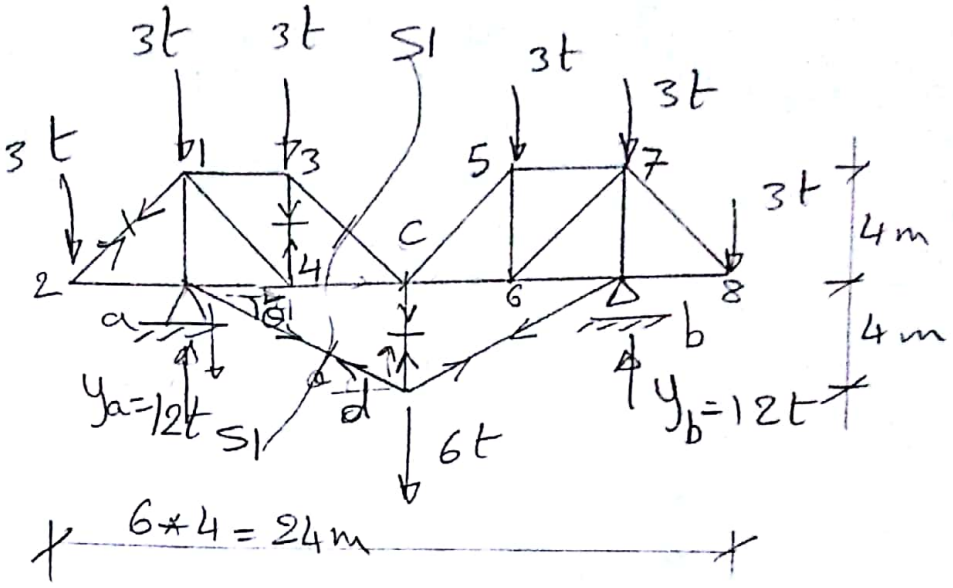




$M_d = -3.5 + 4 + 1 + 4 + 2 = -6 mt\ m\ t$

Q2

$\tan\theta = \frac{1}{2}$



$y_a = y_b = 12t$

Member a d

Sec S1-S1

$\Sigma M @ c \text{ left} = 0$

$\therefore 3[12+8+4] - 12*8 + F_{ad}\sin\theta * 8 = 0$

$\therefore \boxed{F_{ad} = +6.71\ t}$ tens

Member c-d

Joint d

$\Sigma Y = 0$

$\therefore 2F_{a-d}\sin\theta + F_{d-c} - 6 = 0$

$\therefore \boxed{F_{d-c} = \text{Zero}}$

Member F_{3-c}

Joint c, $\Sigma Y = 0$ → $\boxed{F_{3-c} = 0}$

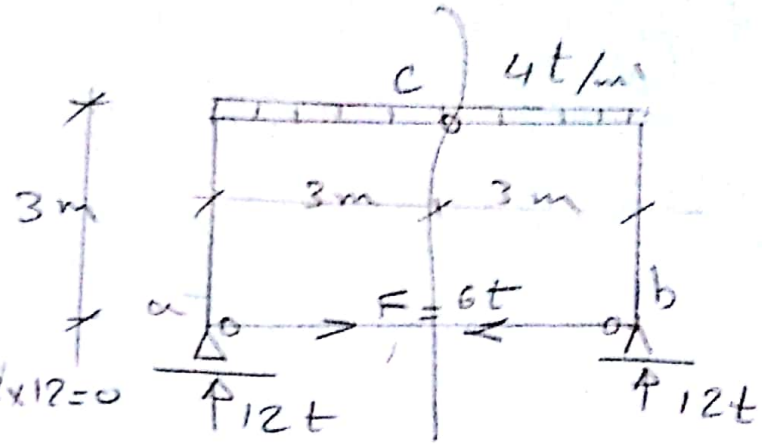
Member 3-4 Joint 3, $\Sigma Y = 0$ $\therefore \boxed{F_{3-4} = -3t}$

Member 1-2, Joint 2, $\Sigma Y = 0$

$\therefore F_{1-2} = \frac{3}{\cos 45} = \boxed{4.24\ t = F_{1-2}}$

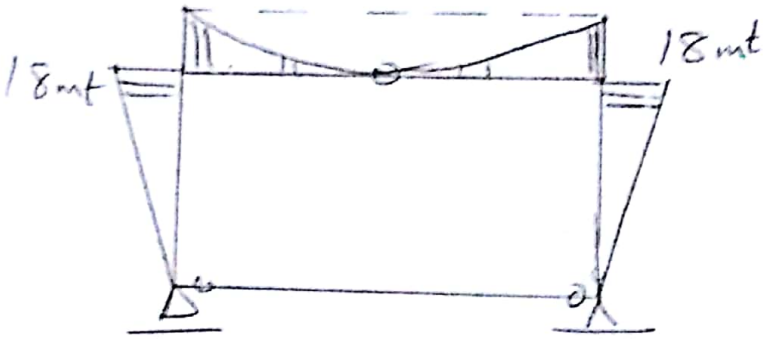
Q3

$\Sigma M @ c = 0$



$\therefore 4 \times 3 \times 1.5 + F \times 3 - 3 \times 12 = 0$

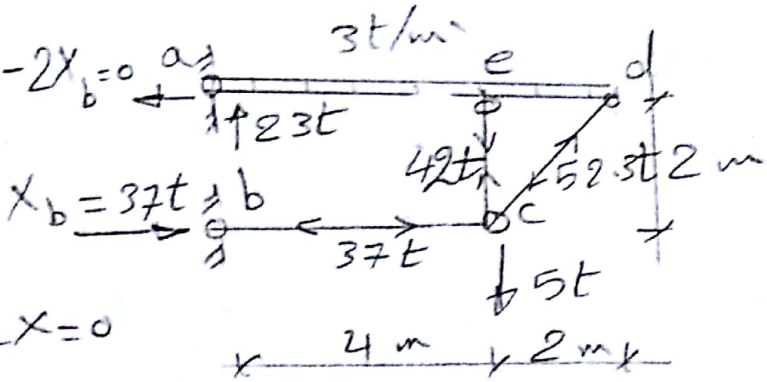
$\therefore F = +6t$



$\Sigma M @ a = 0$

$\therefore -3 \times 6 \times 3 + 5 \times 4 - 2X_b = 0$

$\therefore X_b = 37t$



F_{c-d}, Joint c, $\Sigma X = 0$

$\Sigma X = 0$

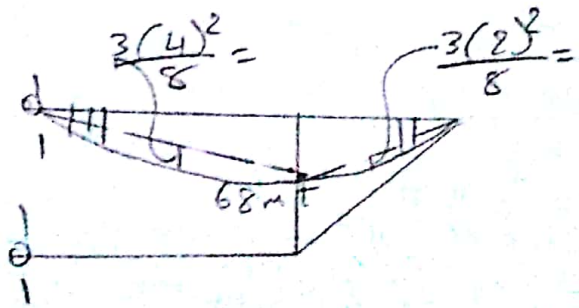
$\therefore F_{c-d} = 52.3t$

$\Sigma Y = 0$ at jt c $\rightarrow F_{c-e} = 42t$

$F_{c-e} - F_{c-d} \cos 45 - 5 = 0$

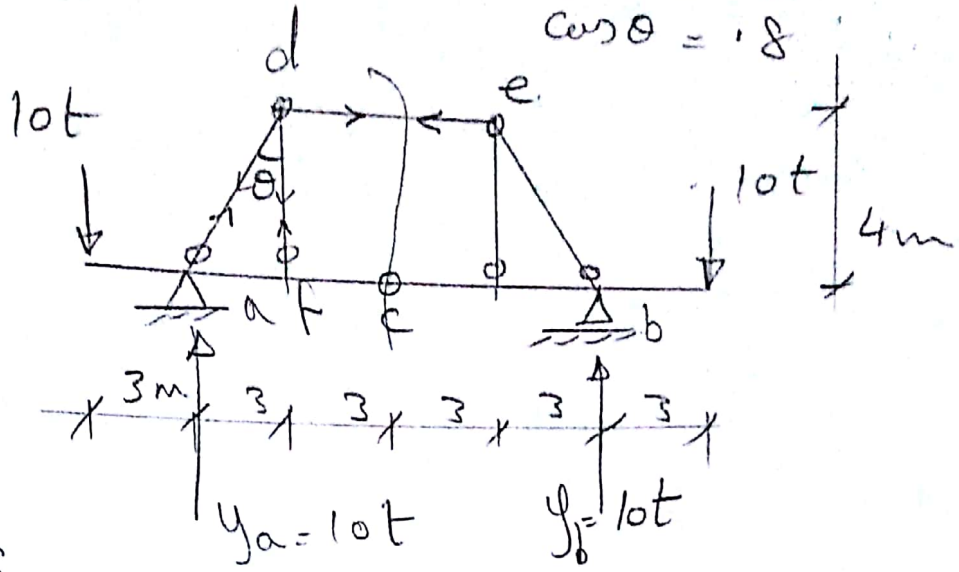
$M_e = 23 \times 4 - 3 \times 4 \times 2$

$= 68$ mt



$\sum a = 0$

$\sin\theta = .6$
$\cos\theta = .8$



-de

Sec S-S

$\sum M @ C \text{ left} = 0$

$F_{d-e} * 4 + y_a * 6 - 10 \times 9 = 0$

$\therefore \boxed{F_{d-e} = +7.5t}$ comp

Member a-d

Joint d : $\sum X = 0$

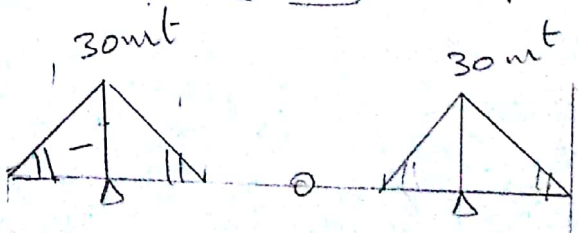
$\therefore F_{d-e} - F_{ad} \sin\theta = 0$

$\therefore \boxed{F_{ad} = +12.5}$ tens.

Member d-f , Joint d , $\sum Y = 0$

$\therefore F_{df} + F_{ad} \cos\theta = 0$

$\therefore \boxed{F_{d-f} = -10\,t}$ comp



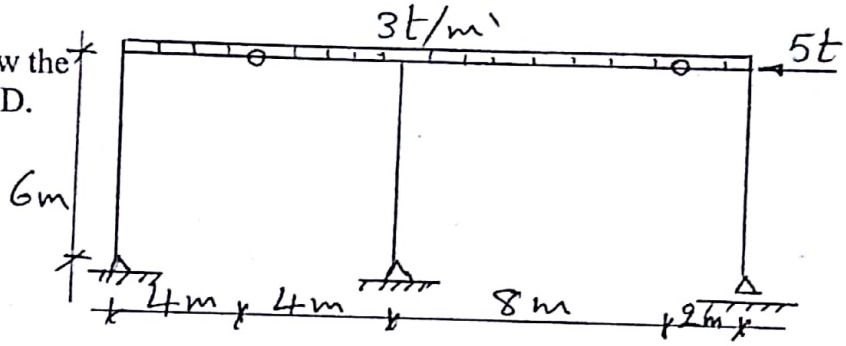
$M_f = -10 * 6$
$+10 * 3$
$+F_{ad} \cos\theta * 3 = \text{zero}$

Higher Technological Institute
10th of Ramadan City
Department of Civil Engineering

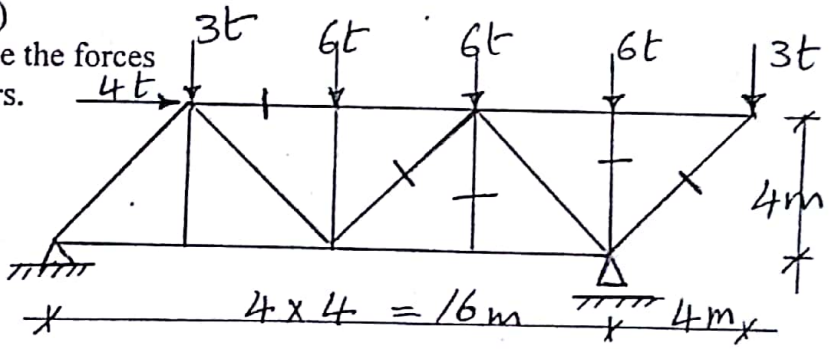
Subject: Structures (CT 112)
Examiner: Dr.Manal K. Zaki
Exam: Final

Term: Jan-May 2008
Time: 2 hours

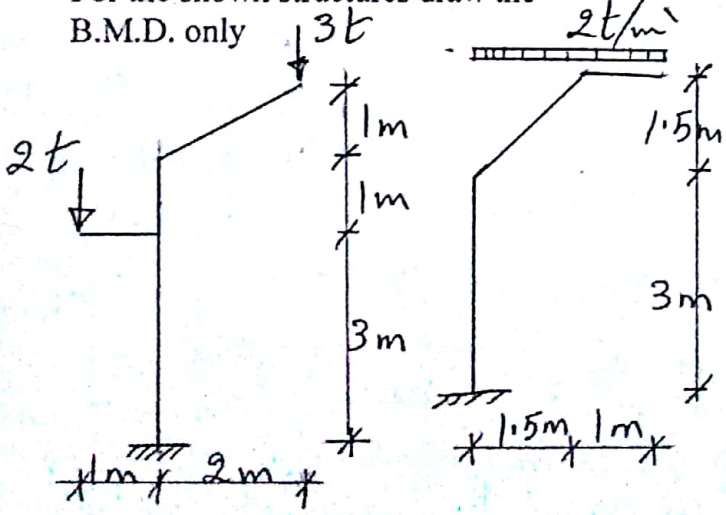
Question 1(15 marks)
For the shown frame draw the N.F.D., Q.F.D. and B.M.D. under the given loads

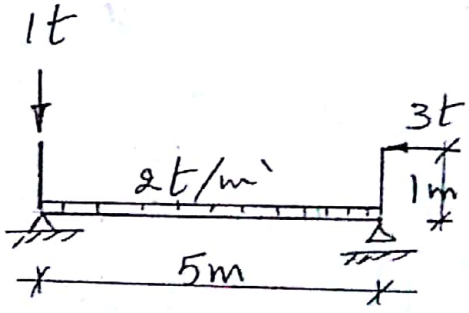


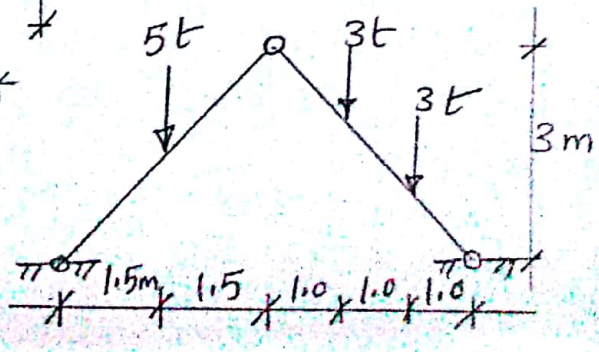
Question 2 (15 marks)
For the shown compute the forces In the marked members. Check graphically



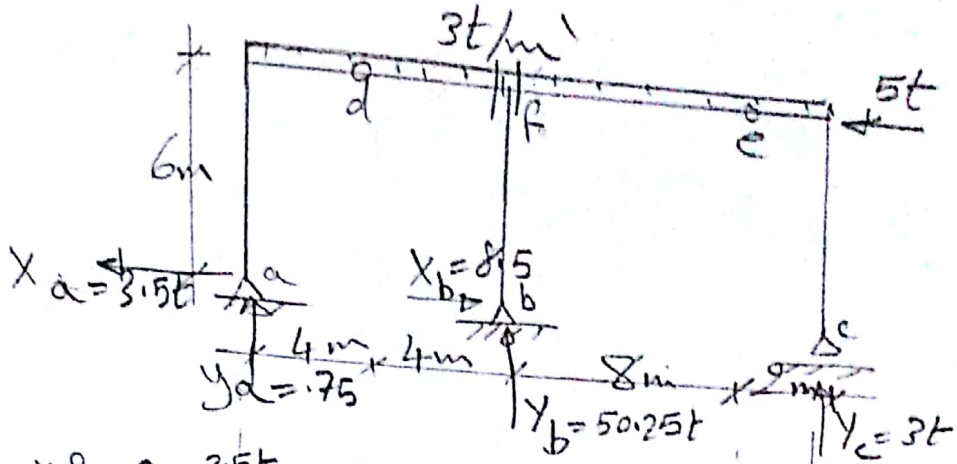
Question 3 (10 marks)
For the shown structures draw the B.M.D. only







Q1



$\Sigma M_{e\ right} = 0$

$\therefore 3\times2\times1 - Y_c \times 2 = 0$

$\therefore Y_c = 3t$

$\Sigma M_a = 0$

$\therefore 3\times18\times9 - Y_b\times8 - Y_c\times18 - 5\times6 = 0$

$\therefore Y_b = 50.25t$

$\Sigma M_b = 0$

$\therefore 3\times18\times1 + Y_a\times8 - 5\times6 - Y_c\times10 = 0$

$\therefore Y_a = .75\ t$

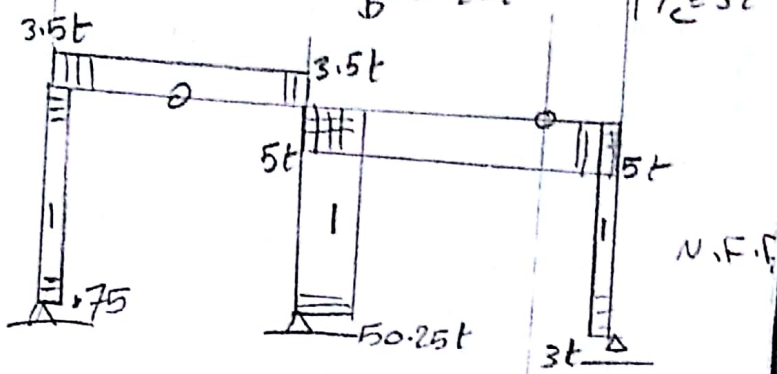
check $\Sigma Y = 0$

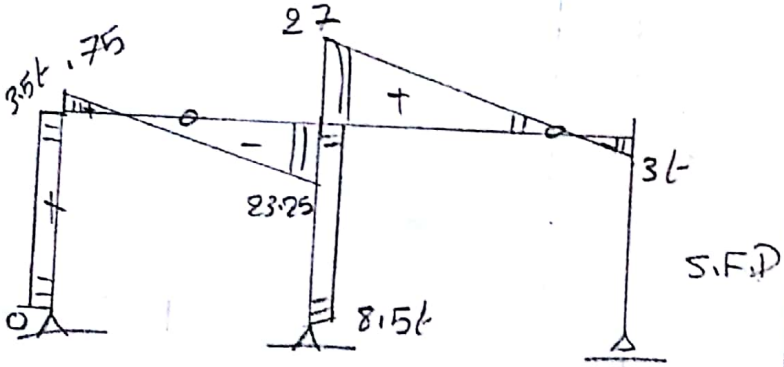
$\Sigma M_{d\ left} = 0$

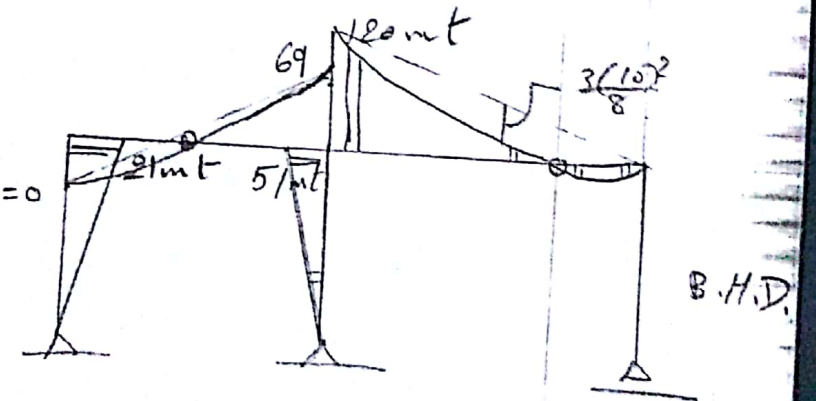
$3\times4\times2 - Y_a\times4 - X_a\times6 = 0$

$\therefore X_a = 3.5t$

$\therefore X_b = 8.5t$





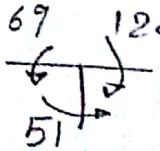


$M_{f\ right}$

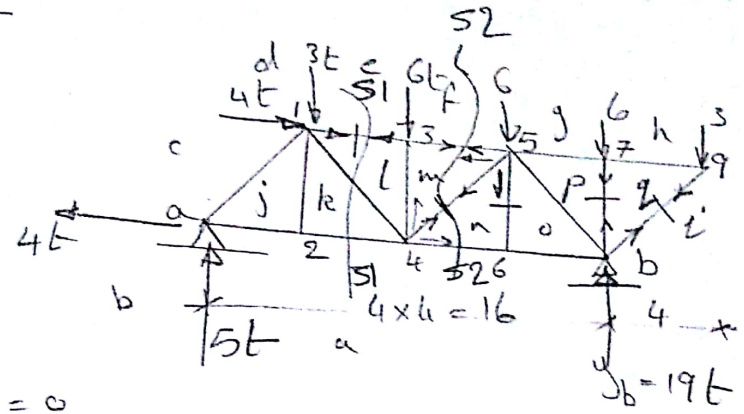
$= 3\times10^2\times5 - 3\times10$

$= 150 - 30$

$= 120$



Q2



$\Sigma M_a = 0$

$\therefore -4\times4 + 3\times4 + 6(8+12+16) + 3\times20 - Y_b \times 16 = 0$

$\therefore Y_b = 19t$

$\therefore Y_a = 5t$

Sec S1-S1

ΣM_4 left $= 0$

$\therefore 5\times8 + F_{1-3}\times4 + 4\times4 - 3\times4 = 0$

$\therefore \boxed{F_{1-3} = -11\ t}$ comp.

$\therefore \boxed{F_{3-5} = -11\ t}$ comp.

Sec S2-S2

ΣM_6 right $= 0$

$\therefore F_5 \times 4 + F_{4-5}\cos45\times4 + 19\times4 - 6\times4 - 3\times8 = 0$

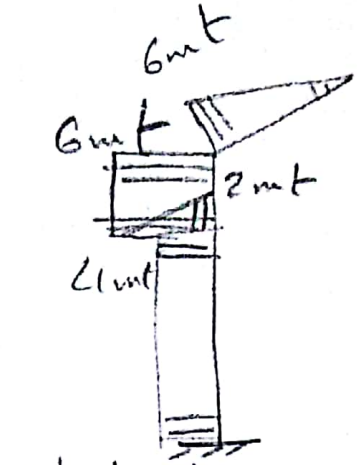
$\therefore \boxed{F_{4-5} = 5.66\ t}$ tens

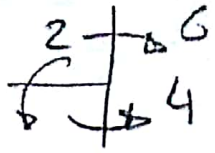
Joint 6: $\boxed{F_{6-5} = 0}$

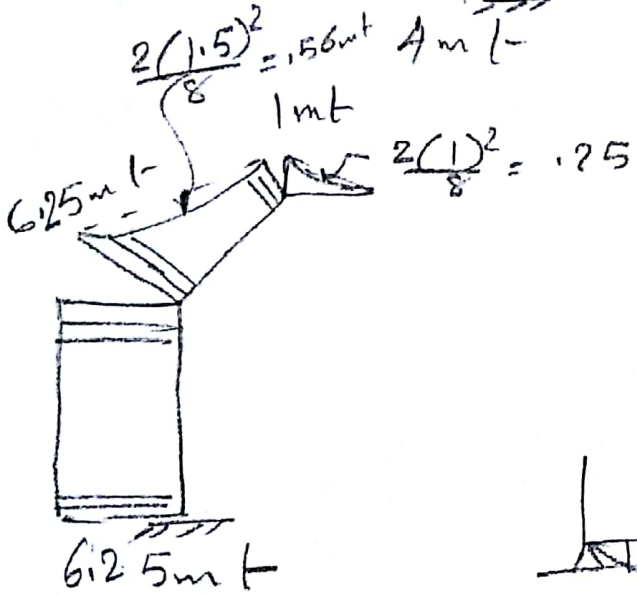
Joint 7: $\boxed{F_{7-4} = -6\ t}$ comp.

Joint 9 $\therefore 3 + F_{9-b}\cos45 = 0$ $\boxed{F_{9-b} = -4.24\ t}$ comp

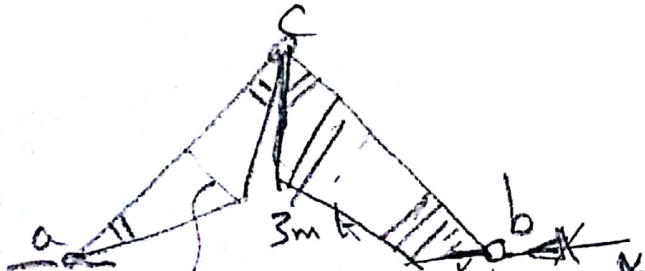
3







$\frac{2(5)^2}{8} = 6.25$



$X_b = 2.75$

$\frac{5(3)}{4} = 3.75mt$ $y_a =$

$\Sigma M_a = 0$

$\therefore 5 \times 1.5 + 3 \times 4 + 3 \times 5 - y_a \times 6 = 0$

$\therefore y_a = 5.75$

$\Sigma M_{c\,right} = 0$

$3 \times 1 + 3 \times 2 + X_b \times 3 - 5.75 \times 3 = 0 \rightarrow X_a = 2.75$

HIGHER TECHNOLOGICAL INSTITUTE | **3rd semester 2016-2017**

Civil Engineering Department | **Mid-term Exam**

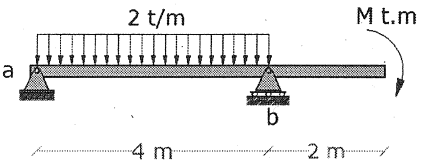
Theory of Structures (2) | **Code : CT112**

Time allowed: 1.5 hr. | **Examiner:** Dr. Ahmed Youssef

***** The exam consists of four questions in four pages attempt all.**

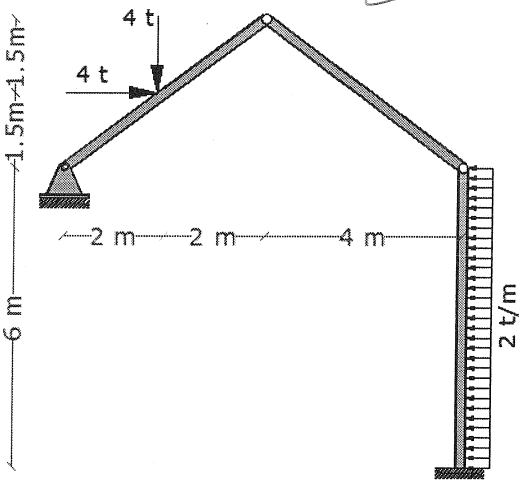
Question (1): (3 Marks) a2, b2, c2, d1

For the shown beam find the value of the shown clockwise concentrated moment (M), such that the supports can sustain load up to 2 t (tension) and 6 t (compression).



Question (2): (5 Marks) a2, b2, c2, d1

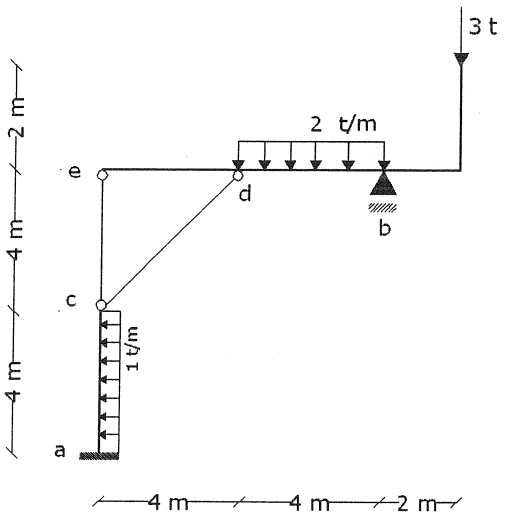
Find the supports reactions for the shown structure.



Best Wishes.

Question (3): (6 Marks) a2, b2, c2, d1

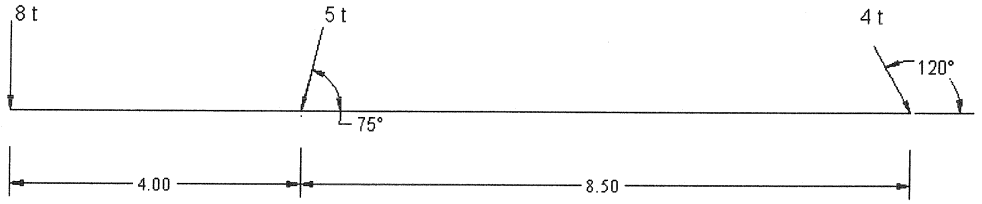
Detriment the external reactions and the force in link members for the shown frame.



Best Wishes.

Question (4): (6 Marks) a2, b2, c2, d1

Determine the magnitude, direction, point of application of the force which make the system in equilibrium for the shown system



Best Wishes.

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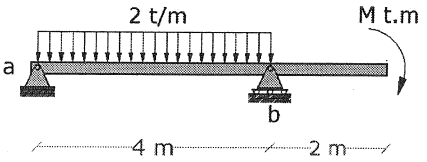


Only support (a) can expose to tension.

***In first case the vertical reaction (y_a) must not excess 2t (downward).

- $\sum M_b = 0$

$2*4*2 + 2*4 - M = 0 \quad M = 24$ t.m --------1

***In second case the vertical reaction (y_b) must not excess 6t (upward).

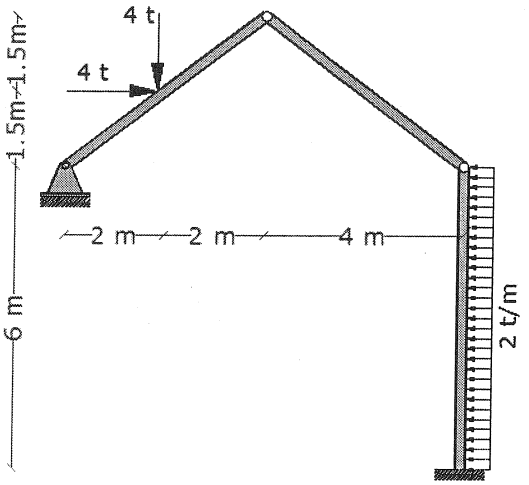
- $\sum M_a = 0$

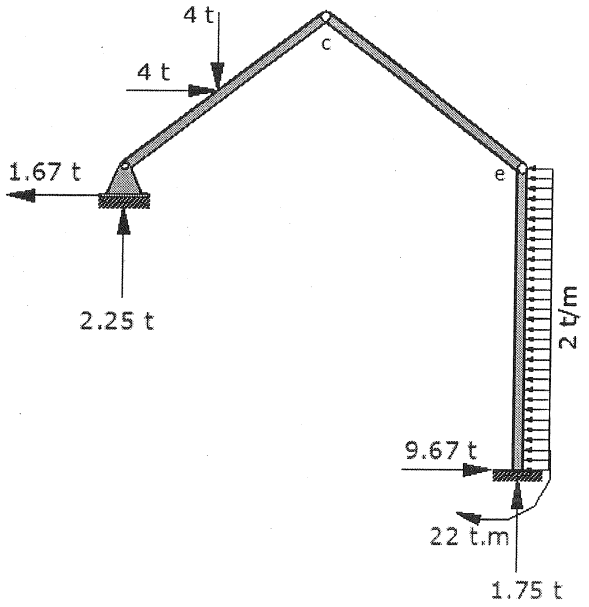
$2*4*2 - 4*6 + M = 0 \quad M = 8$ t.m --------1

We can satisfy the two condition by Moment= 8 t.m --------1

Question (2): (5 Marks)

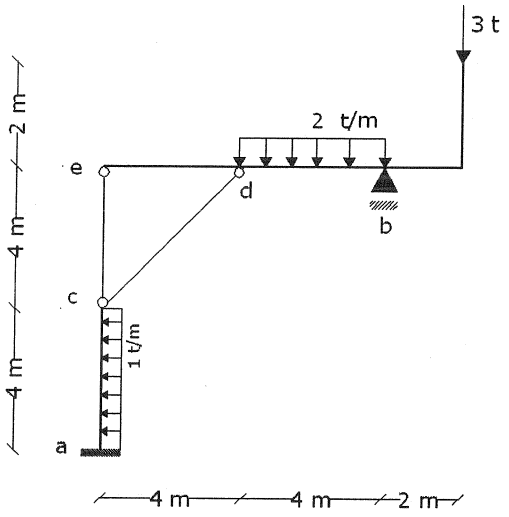
Find the supports reactions for the shown structure.





Question (3): (6 Marks)

Detriment the external reactions and the force in link members for the shown frame.



- $\sum M_c = 0$

$3*10 + 2*4*6 - 8\,Y_b = 0 \quad Y_b = 9.75$ t (upward) --1

- $\sum Y = 0$

$8 + 3 - Y_a - 9.75 = 0 \quad Y_a = 1.25$ t (upward --------1

- $\sum X = 0$

$X_a = 4$ t (to the right) --------1

- $\sum M_a = 0$

$3*10 + 2*4*6 - 8*9.75 - 4*2 - M_a = 0 \quad M_a = 8$ t.m (clockwise) --1

- $\sum M_d = 0$

$3*6 + 2*4*2 - 4\,F_{ec} = 0 \quad Y_b = 8.5$ t (tension) --1

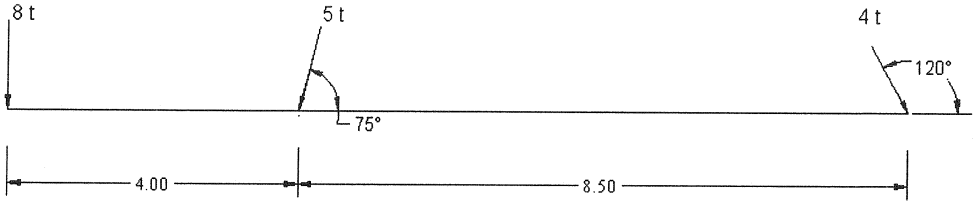
- $\sum Y = 0$

$8 + 3 + 8.5 - F_{ed} \cos 45 = 0 \quad F_{ed} = 27.577$ t (compression) --------1

Best Wishes.

Question (4): (6 Marks)

Determine the magnitude, direction, point of application of the force which make the system in equilibrium for the shown system



Solution:-

-Analytical

$\sum F_x = R_x$

$R_x = -5 \cos(75) + 4 \cos(60) = 0.705$ t (left)

$\sum F_y = R_y$

$R_y = -8 - 5 \sin(7) - 4 \sin(60) = -16.29$ t (upward)

$R = ((R_x)^2 + (R_y)^2)^{0.5} = 16.30$ t

$\text{Tan}\,\theta = R_y / R_x$ ⇨⇨⇨⇨⇨ $\theta = 92.47°$

$R * x \sin(87.53) = 5 * 4 \sin(75) + 4 * 12.5 \sin(60)$ ⇨⇨ $X = 3.85$ m

Best Wishes.

Higher Technological Institute — Civil Eng. Department

Mid-Term Exam – (Sep-Jan 2016)

Dr.Manal Kamal Zaki — Theory of Structures (2)-CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1 ILO's

For the shown beam:

1. Separate at C and D. [a2] [2 marks]
2. Find the reactions. [a2] [2 marks]
3. Draw the N.F.D., Q.F.D. & BM.D. [a2] [4 marks]

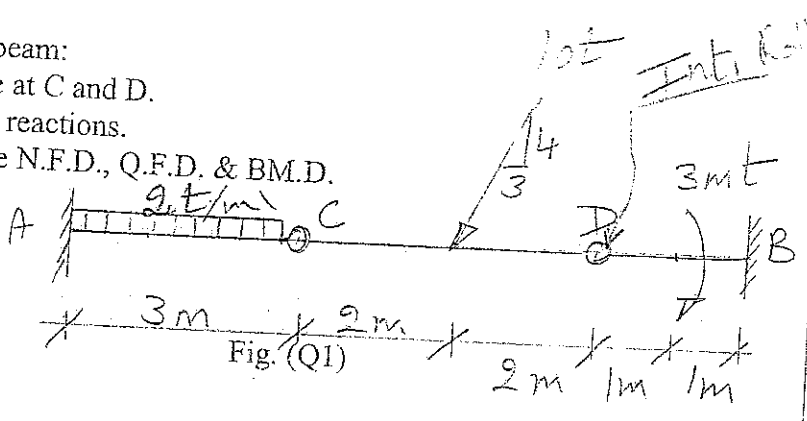


Fig. (Q1)

[Total 8]

Q2

For the shown beam :

1. Find the reactions. [a1] [3 marks]
2. Draw the N.F.D., Q.F.D. [a2] [3 marks]
3. Draw B.M.D. [a2] [4 marks]

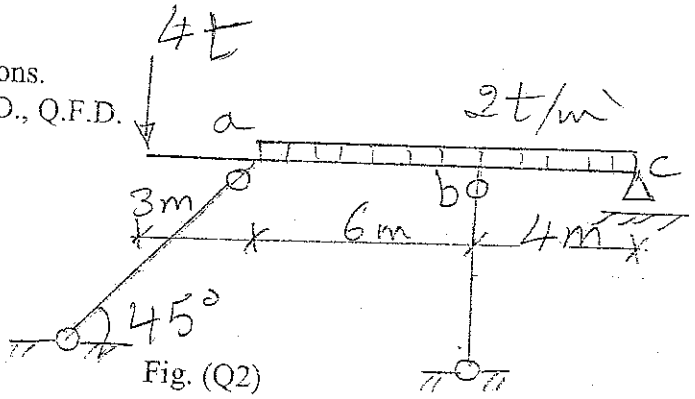


Fig. (Q2)

[Total 10]

Q3

For the shown Frame:

4. Find the reactions. [a1] [2 marks]
5. Draw the N.F.D., Q.F.D. [a2] [4 marks]
6. Draw B.M.D. [a2] [4 marks]

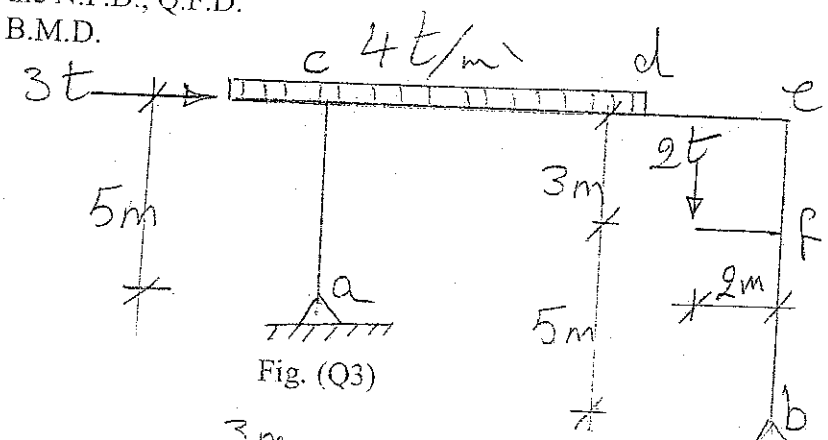
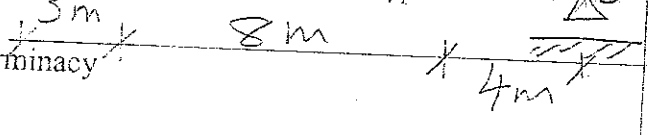


Fig. (Q3)

[Total 10]

Q4

Discuss the stability and determinacy of the shown structure: [d1] [2 marks]



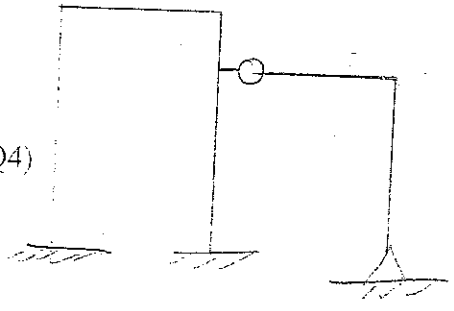


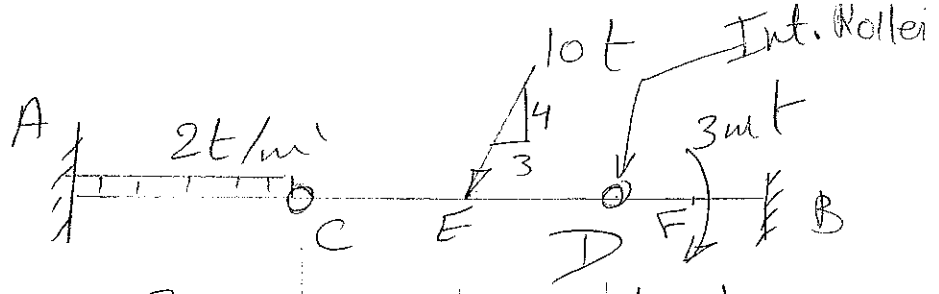
Fig. (Q4)

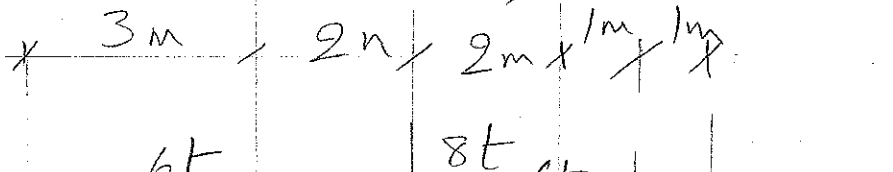
[Total 2]

[Total 30]

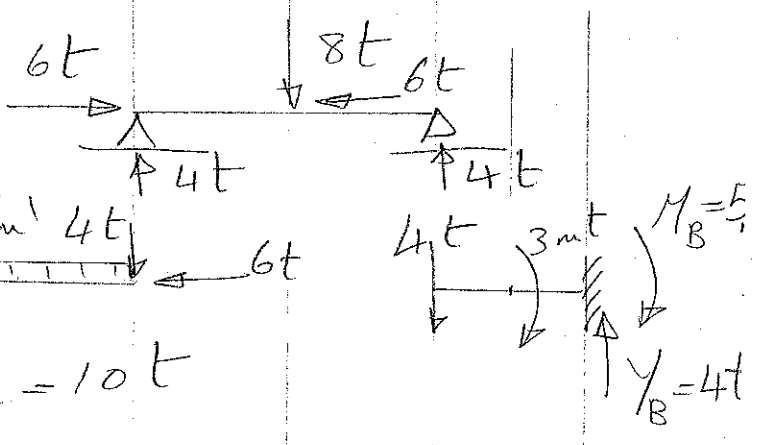
Mail.

Q1





Part AC



$Y_A = 4 + 2 \times 3$

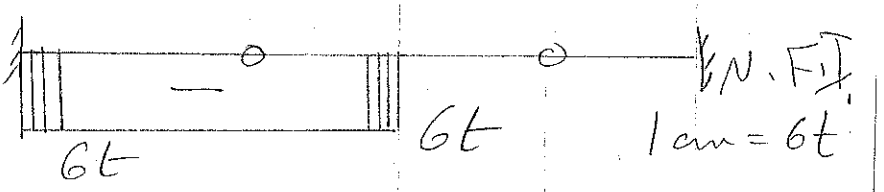
$= 10\ t$

$M_A = 21\ mt$

$M_A = 4 \times 3 + 2 \times 3 \times 1.5$

$= 21\ mt$

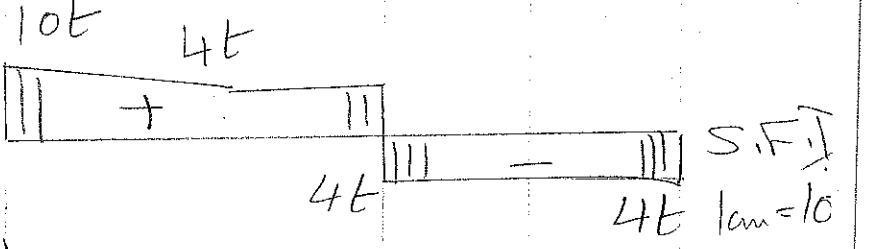
Part DB

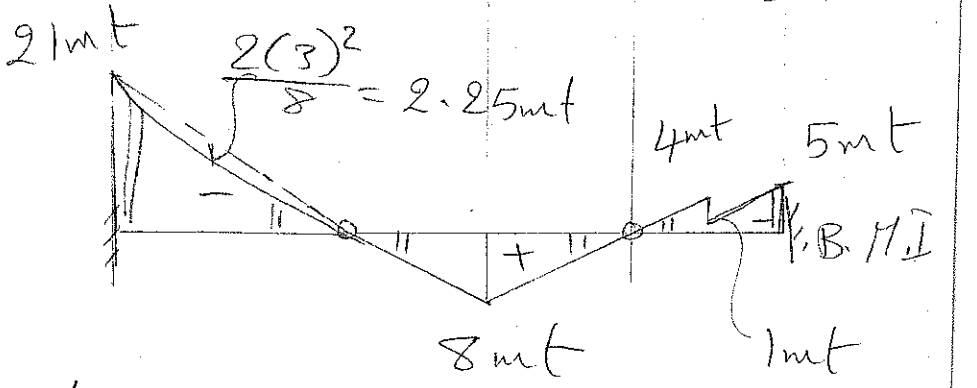


$\sum M @ B = 0$

$\therefore 4 \times 2 - 3 - M_B = 0$

$\therefore M_B = 5\ mt$



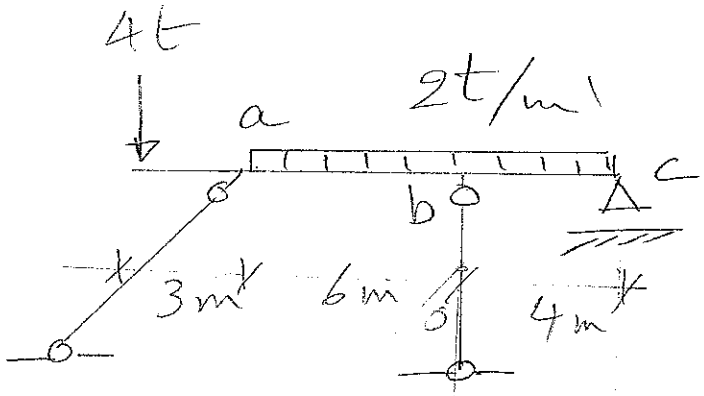


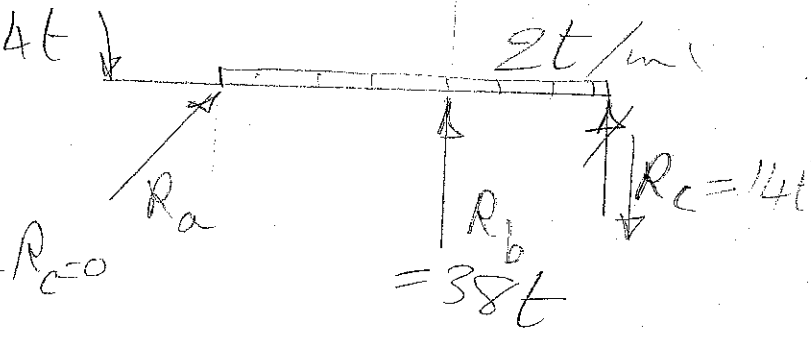
$M_E = 4 \times 2 = 8\ mt$

$M_{F\ left} = -4 * 1 = -4\ mt$

$M_{F\ right} = -4 + 3 = -1\ mt$

Q2





$\Sigma M_{@a} = 0$

$4 \times 9 + 2 \times 10 \times 1 + 4R_c = 0$

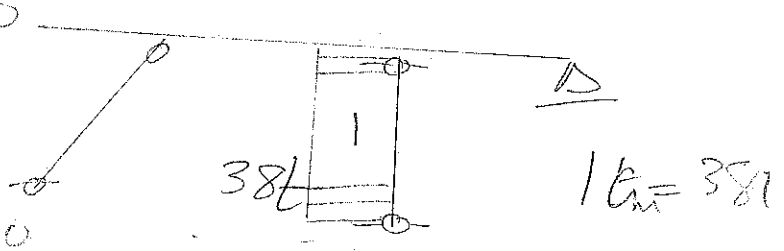
$\therefore R_c = -14t$

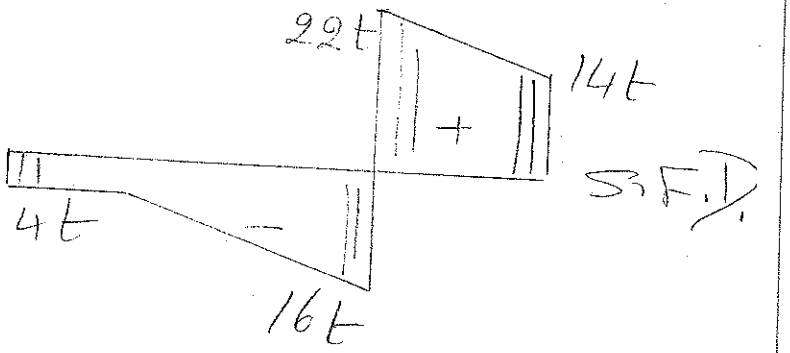
$\Sigma F_x = 0 \rightarrow R_a = 0$

$\Sigma F_y = 0$

$\therefore 4 + 2 \times 10 + 14 - R_b = 0$

$\therefore R_b = 38t$

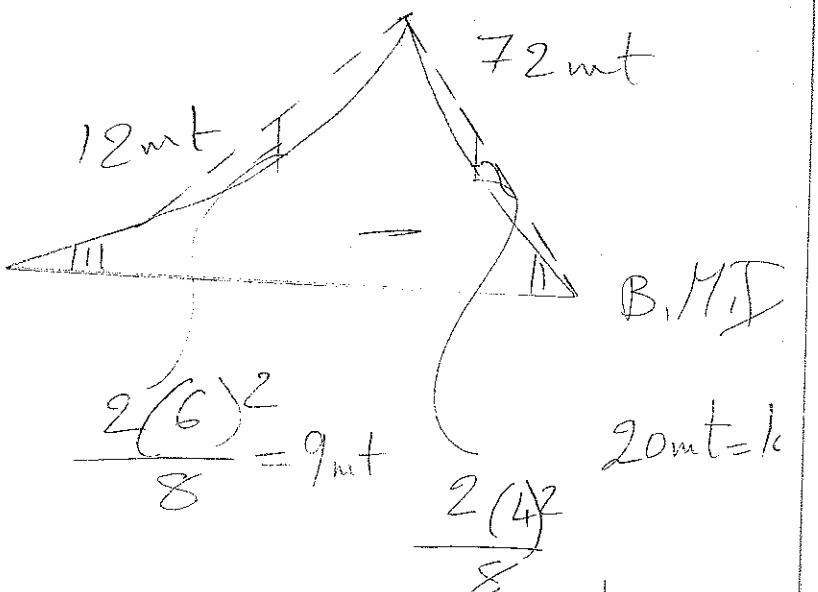




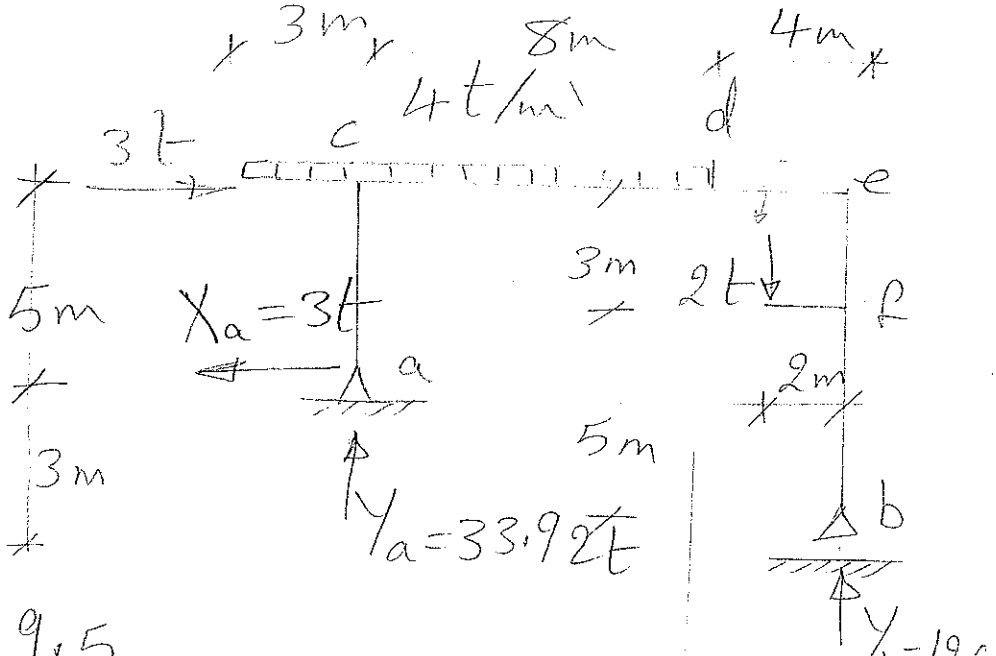
$M_a = -4 \times 3 = -12 mt$

$M_b = -14 \times 4 = 2 \times 4 \times 2$

$= -72 mt$



Q 3



① $\Sigma M_{@b} = 0$

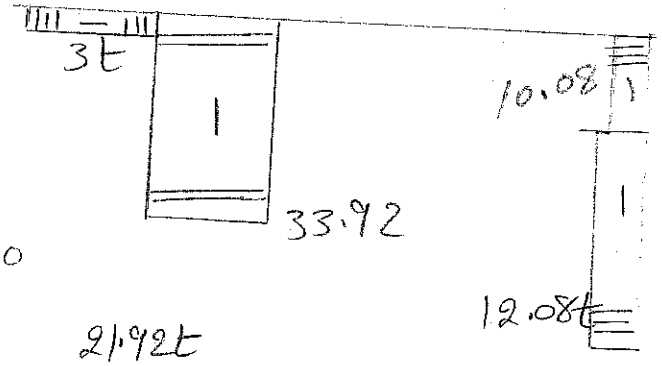
$2 \times 2 + 4 \times 11 \times 9.5 + 3 \times 3 - 3 \times 8 - 12 Y_a = 0$

$\therefore Y_a = 33.92t$

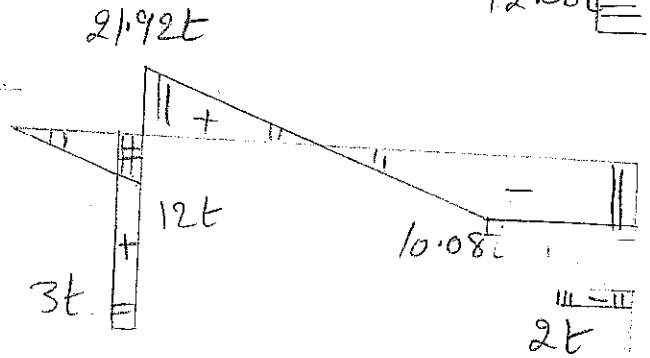
② $\Sigma F_y = 0$

$\therefore 4 \times 11 + 2 - 33.92 - Y_b = 0$

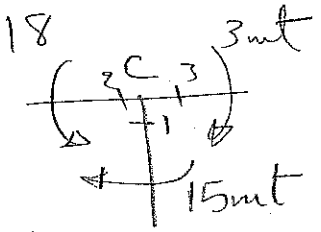
$\therefore Y_b = 12.08t$



N.F.D
1cm=2



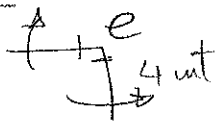
S.F.D
1cm=2

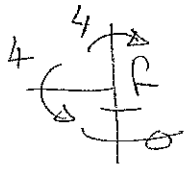


$M_{c_1} = 3 \times 5 = 15$

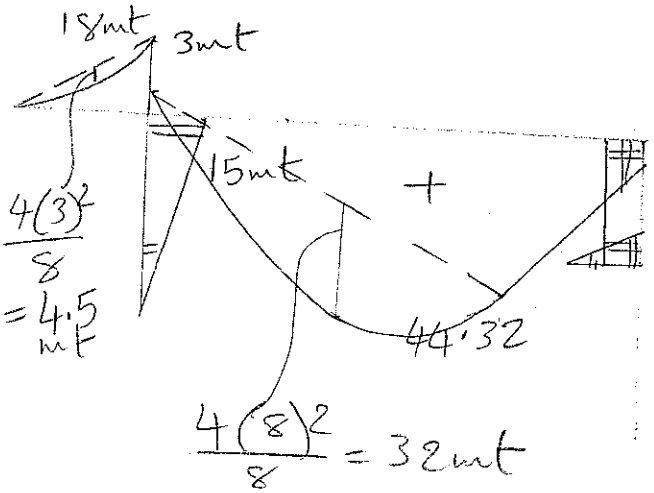
$M_{c_2} = 4 \times 3 \times 1.5 = 18 mt$

$M_e = 2 \times 2 = 4 mt$



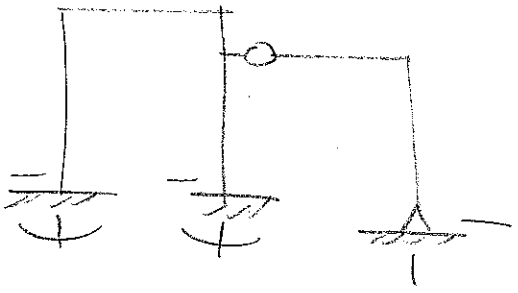


$M_d = 12.08 \times 4 - 2 \times 2 = 44.32 mt$



B.M.D
1cm=2
mt

Q4



$u = 8$

$E = 3 + 1 = 4$

$\therefore$ Stable & 4 times st. Indet.

Higher Technological Institute — Civil Eng. Department

Mid-Term Exam – (Sep-Jan 2016)

Dr.Manal Kamal Zaki — Theory of Structures (2)-CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1

For the shown beam:

1. Separate at D.
2. Find the reactions.
3. Draw the N.F.D., Q.F.D. & BM.D.

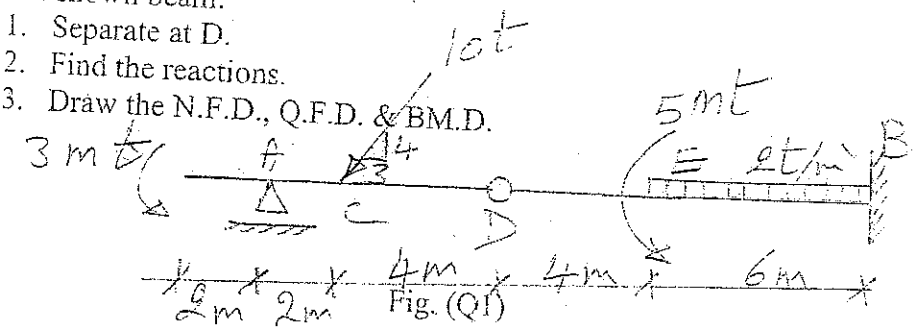


Fig. (Q1)

ILO's: [a2] [a2] [a2] — [2 marks] [2 marks] [4 marks]

Q2 [Total 8]

For the shown beam :

1. Find the reactions.
2. Draw the N.F.D., Q.F.D.
3. Draw B.M.D.

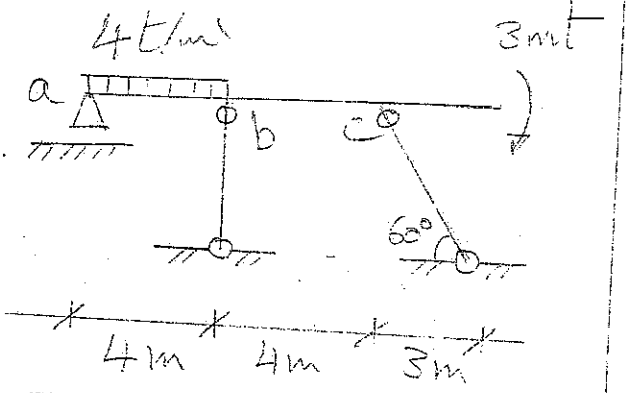


Fig. (Q2)

[a1] [3 marks] [a2] [3 marks] [a2] [4 marks]

[Total 10]

Q3

For the shown Frame:

4. Find the reactions.
5. Draw the N.F.D., Q.F.D.
6. Draw B.M.D.

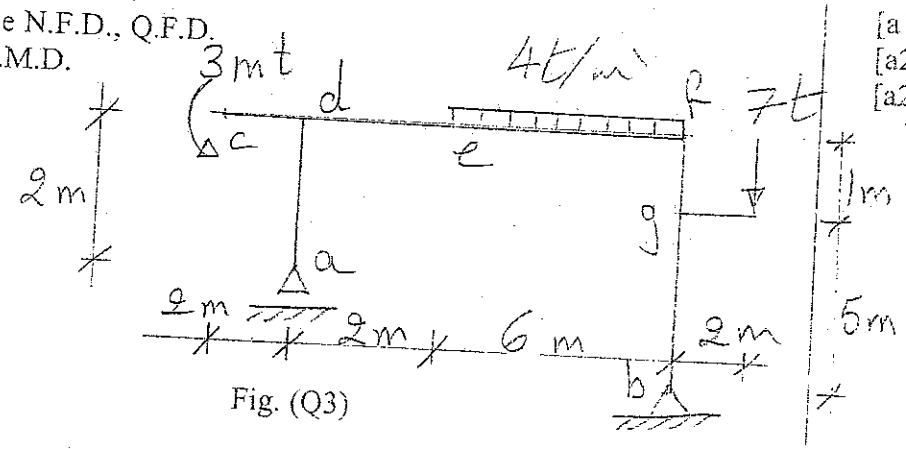


Fig. (Q3)

[a1] [2 marks] [a2] [4 marks] [a2] [4 marks]

[Total 10]

Q4

Discuss the stability and determinacy of the shown structure:

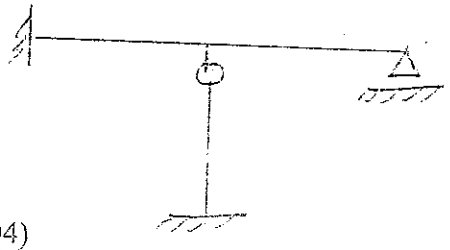


Fig. (Q4)

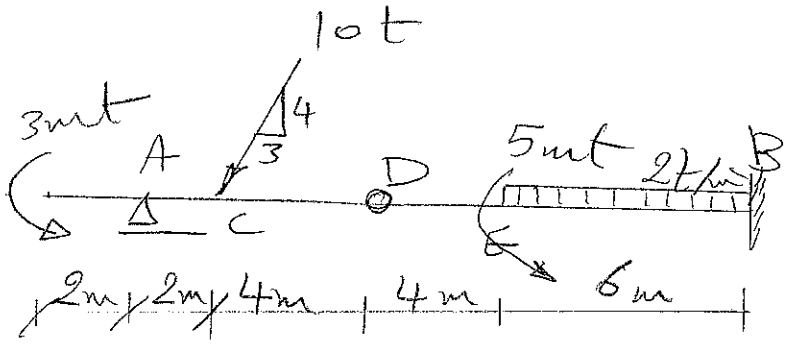
[d1] [2 marks]

[Total 2]

[Total 30]

Mail:

Q1



Upper Part

① $\Sigma M @ D = 0$

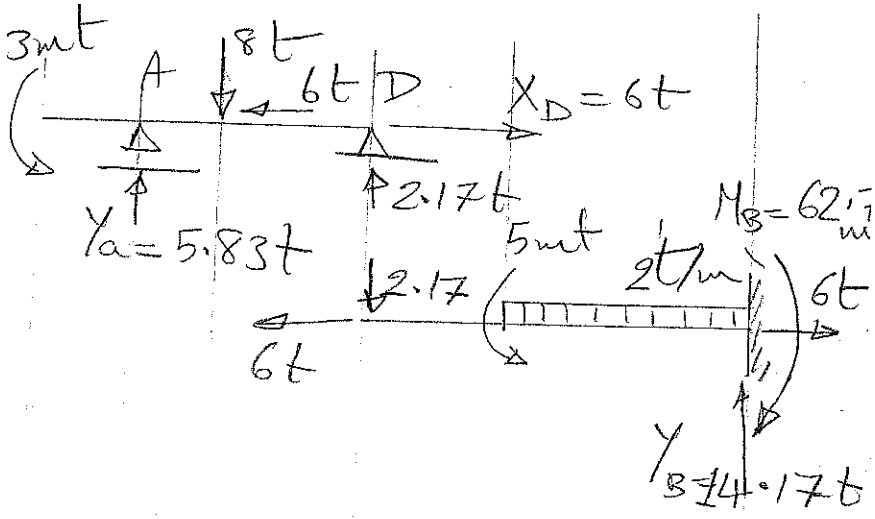
$\therefore 8 \times 4 + 3 - 6Y_a = 0$

$\therefore Y_a = 5.83t$

② $\Sigma F_y = 0$

$\therefore 5.83 - 8 + Y_D = 0$

$\therefore Y_D = 2.17t$



Lower Part

① $\Sigma F_y = 0$

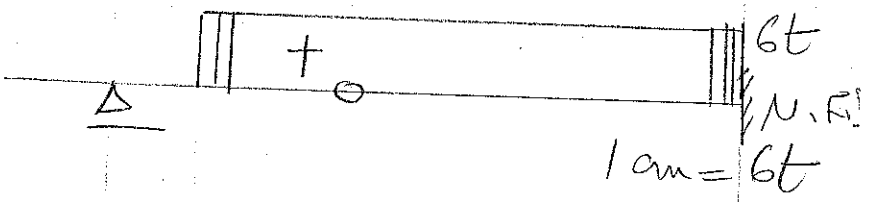
$\therefore 2.17 + 2 \times 6 - Y_B = 0$

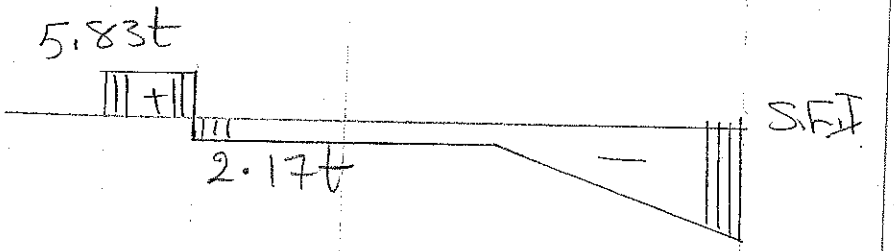
$\therefore Y_B = 14.17t$

② $\Sigma M @ B = 0$

$\therefore 2.17 \times 10 + 5 + 2 \times 6 \times 3 - M_B = 0$

$\therefore M_B = 62.7$ mt

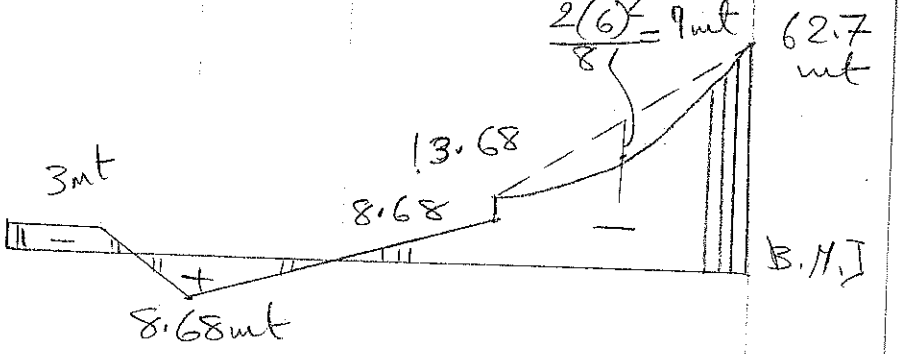




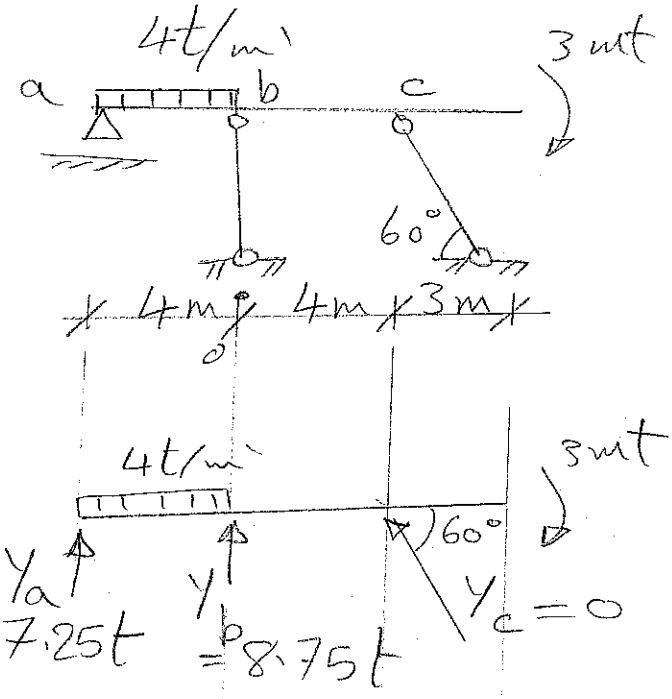
$M_{E_{right}} = 2.17 * 4 = 8.68$ mt

$M_{E_{left}} = -2.17 * 4 = -8.68$

$M_{E_R} = -8.68 - 5 = -13.68$ mt



Q 2



① $\Sigma M_a = 0$

$4 \times 4 \times 2 - 3 - 4Y_b = 0$

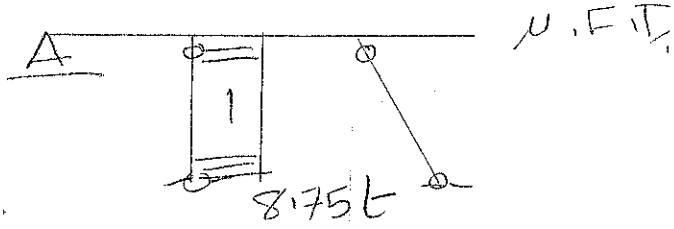
$\therefore Y_b = 7.25t$

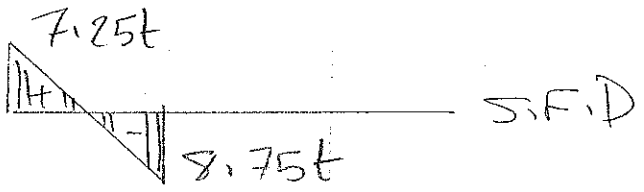
② $\Sigma F_x = 0 \quad \therefore Y_c = 0$

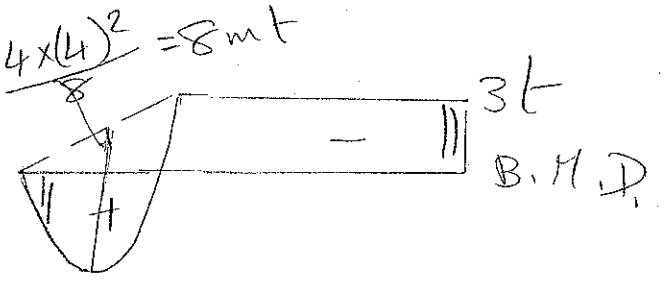
③ $\Sigma F_y = 0$

$\therefore 4 \times 4 - 7.25 - Y_b = 0$

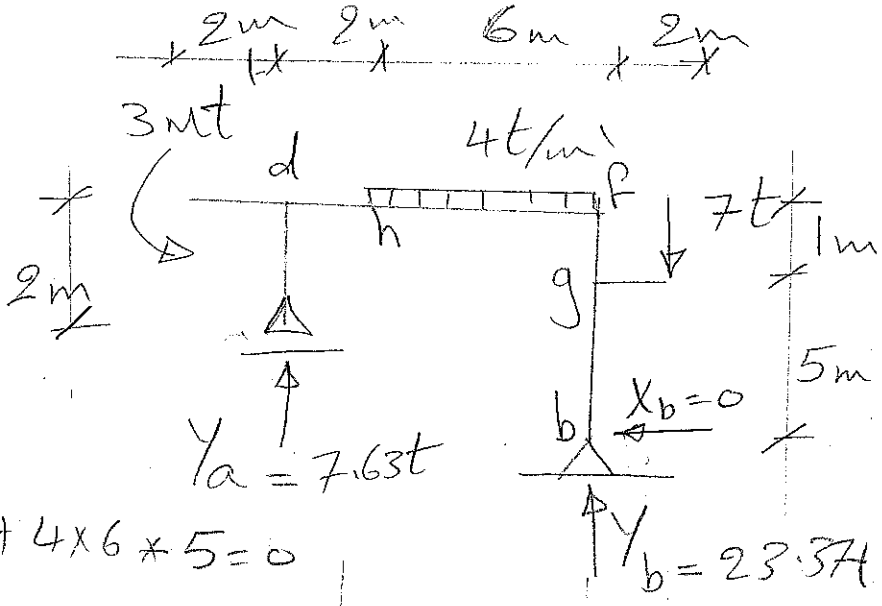
$\therefore Y_b = 8.75t$







Q3



① $\Sigma M @ a = 0$

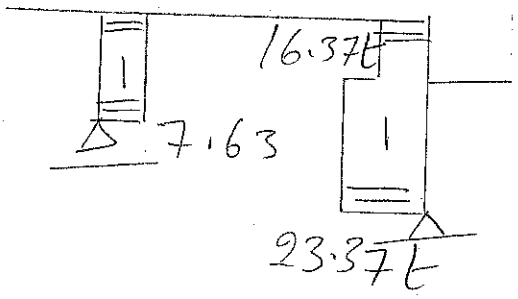
$-3 - 8Y_b + 7 \times 10 + 4 \times 6 \times 5 = 0$

$\therefore Y_b = +23.37t$

② $\Sigma F_y = 0$

$\therefore 23.37 + Y_b - 7 - 4 \times 6 = 0$

$\therefore Y_b = 7.63t$



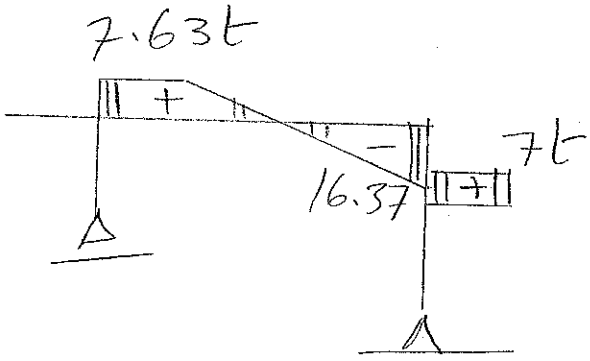
N.F.D

<u>check:</u>

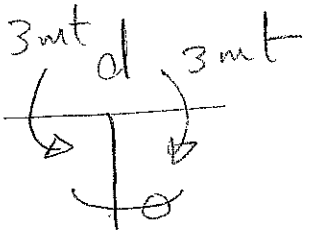
$\Sigma M @ b = 0$

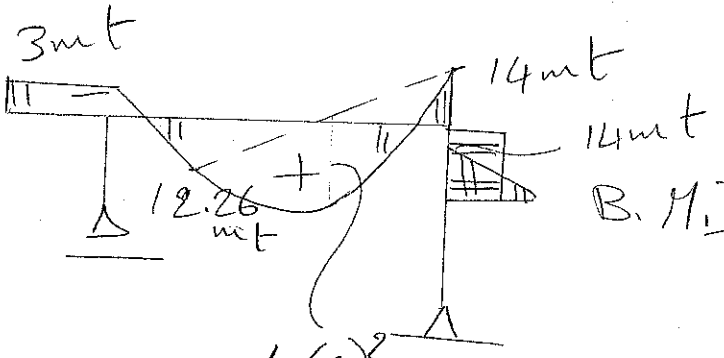
$7 \times 2 - 4 \times 6 \times 3 - 3 + 8Y_a = 0$

$\therefore Y_a = 7.63t$

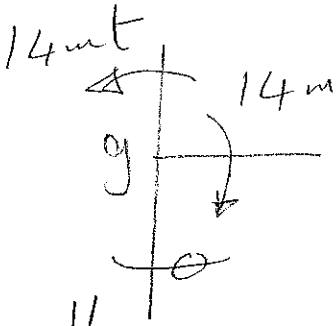


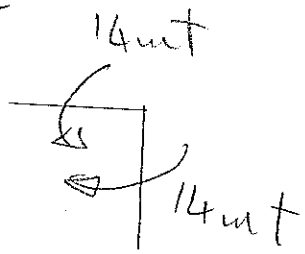
S.F.D





B.M.D





$\frac{4(6)^2}{8} = 18mt$

$M_h = -3 + 7.63 \times 2 = 12.26mt$

Higher Technological Institute — Civil Eng. Department

Mid-Term Exam – (Sep-Jan 2016)

Dr.Manal Kamal Zaki — Theory of Structures (2)-CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1

For the shown beam:

1. Separate at D.
2. Find the reactions.
3. Draw the N.F.D., Q.F.D. & BM.D.

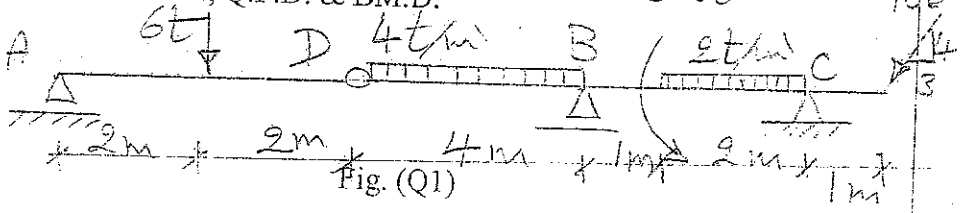


Fig. (Q1)

ILO's	
[a2]	[2 marks]
[a2]	[2 marks]
[a2]	[4 marks]

[Total 8]

Q2

For the shown beam :

1. Find the reactions.
2. Draw the N.F.D., Q.F.D.
3. Draw B.M.D.

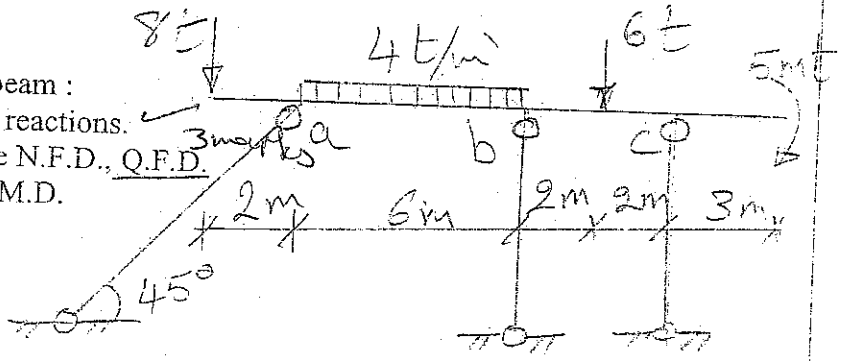


Fig. (Q2)

[a1]	[3 marks]
[a2]	[3 marks]
[a2]	[4 marks]

[Total 10]

Q3

For the shown Frame:

4. Find the reactions.
5. Draw the N.F.D., Q.F.D.
6. Draw B.M.D.

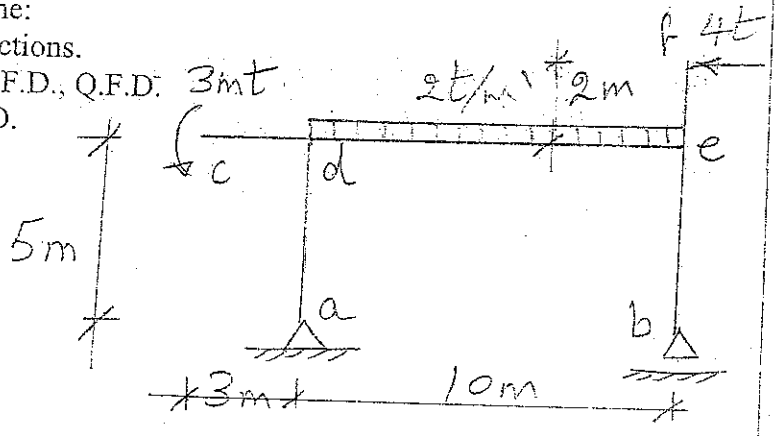


Fig. (Q3)

[a1]	[2 marks]
[a2]	[4 marks]
[a2]	[4 marks]

[Total 10]

Q4

Discuss the stability and determinacy of the shown structure:

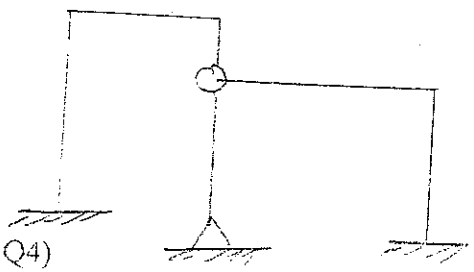


Fig. (Q4)

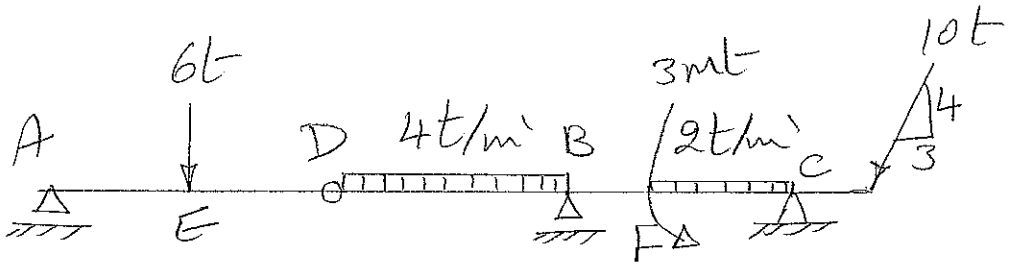
[d1] [2 marks]

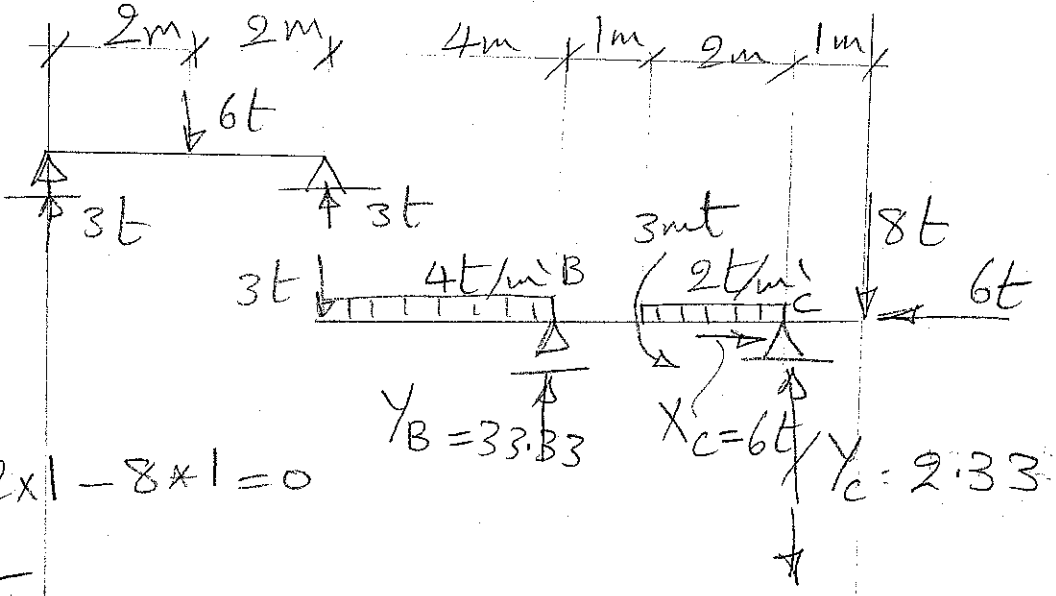
[Total 2]

[Total 30]

Mail:

Q1





lower part

① $\Sigma M@C = 0$

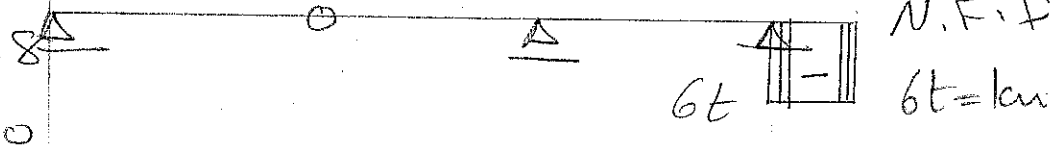
$3*7 + 4*4*5 - 3Y_B + 3 + 2*2*1 - 8*1 = 0$

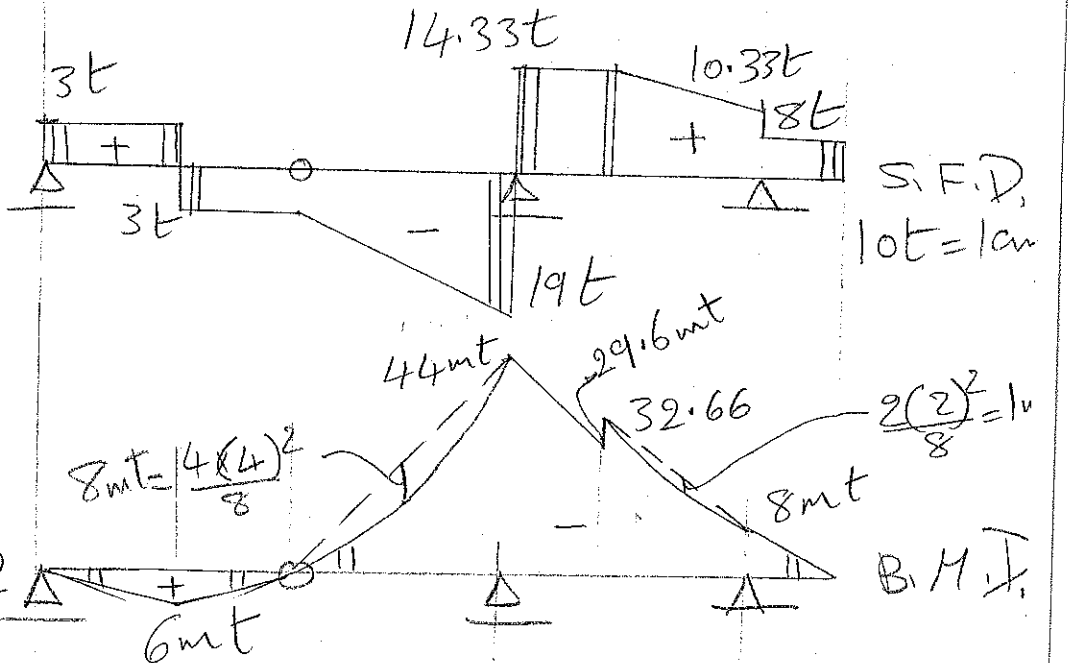
$\therefore Y_B = 33.33t$

② $\Sigma F_y = 0$

$3 + 4*4 + 2*2 + 8 - Y_C - 33.33 = 0$

$\therefore Y_C = -2.33t$





$M_E = 3*2 = 6mt$

$M_B = -3*4 - 4*4*2$

$= -44mt$

$M_C = -8mt$

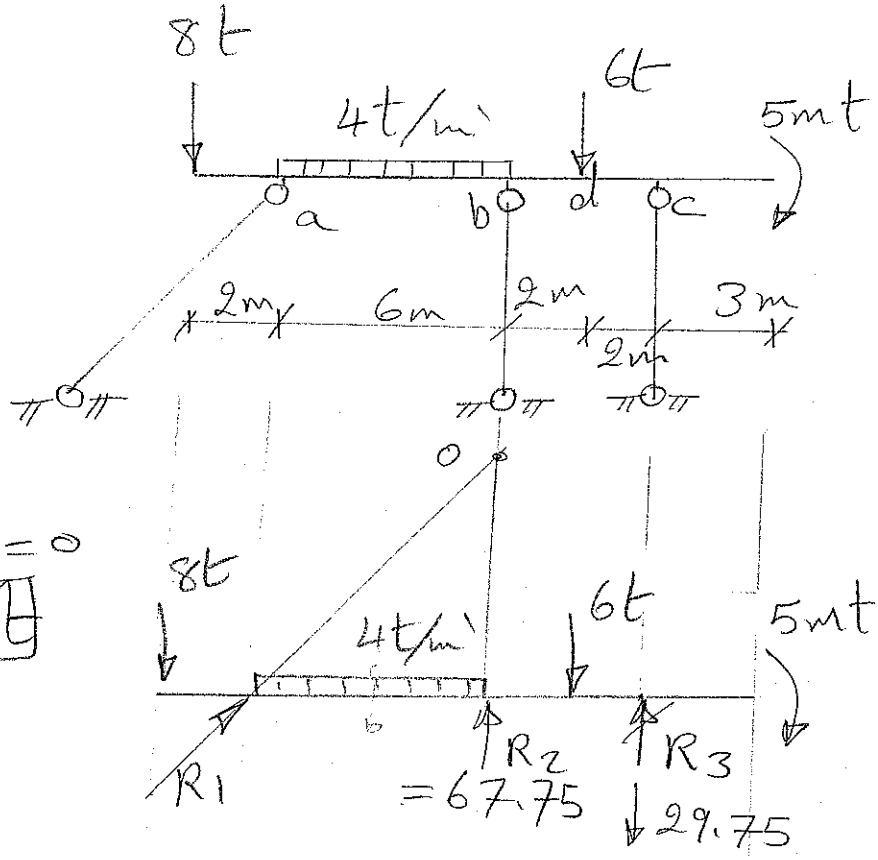
$M_{F\ right} = -8*3 - 2.33*2 - 2*2*1$

$= -32.66$

$M_{C\ left} = -32.66 + 3$

$= -29.6mt$

Q 2



① $\Sigma M @ o = 0$

$8 \times 8 + 4 \times 6 \times 3 + 4R_3 - 6 \times 2 - 5 = 0$

$\therefore \boxed{R_3 = -29.75\ t}$

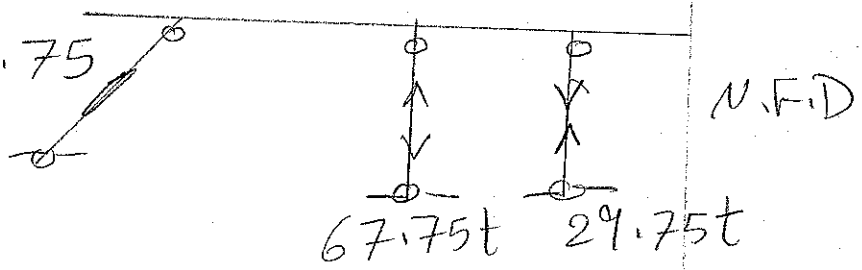
② $\Sigma F_x = 0$

$\therefore R_1 = 0$

③ $\Sigma F_y = 0$

$\therefore 8 + 4 \times 6 + 6 + 29.75 - R_2 = 0$

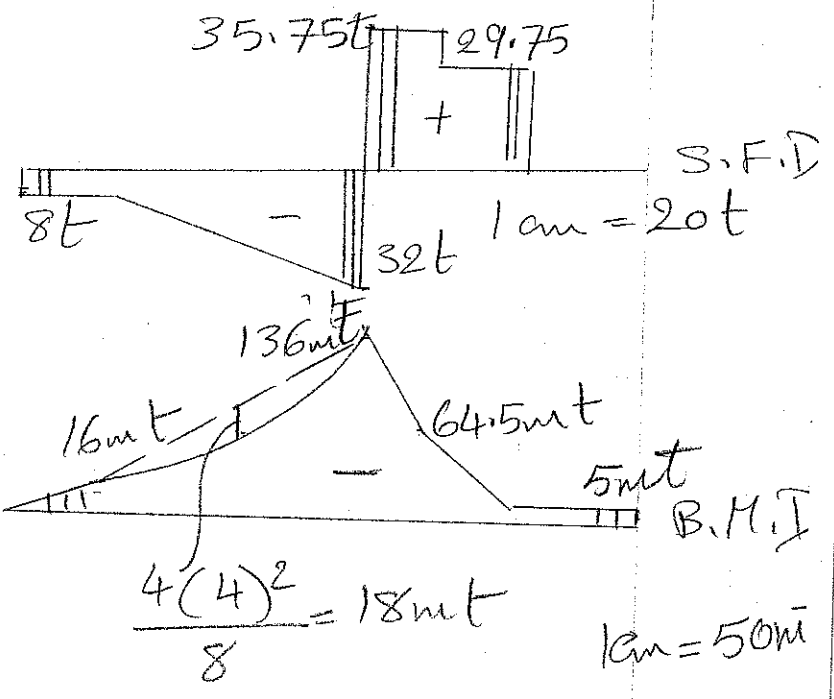
$\therefore \boxed{R_2 = 67.75\ t}$



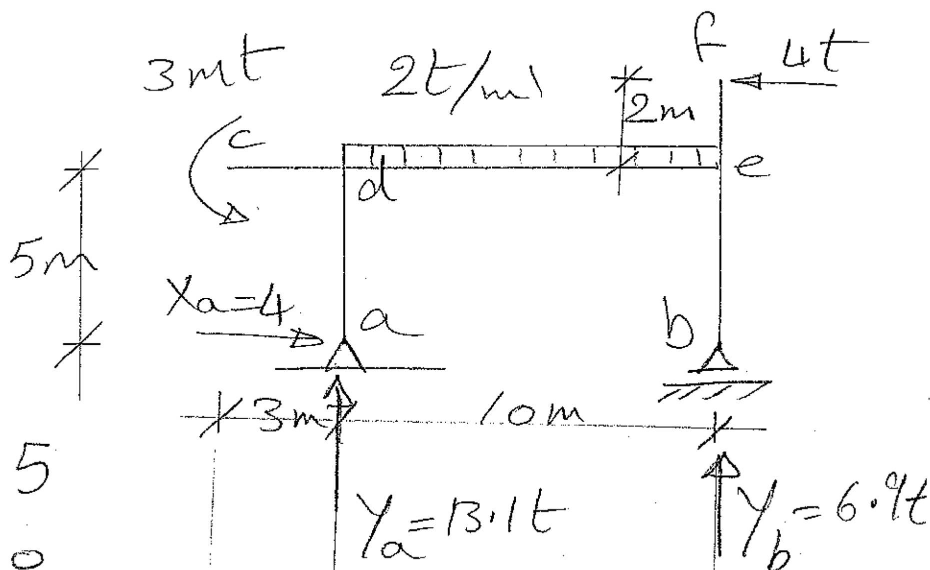
$M_a = -8 \times 2 = -16\ mt$

$M_b = -8 \times 8 - 4 \times 6 \times 3 = -136\ mt$

$M_d = -5 - 29.75 \times 2 = -64.5$



Q3

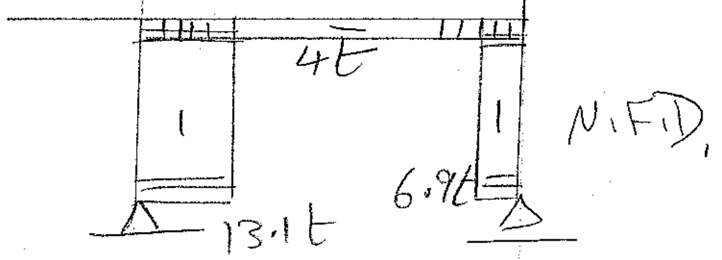


① $\Sigma M @ b = 0$

$4 * 7 + 2 \times 10 \times 5$

$+ 3 - 10 Y_a = 0$

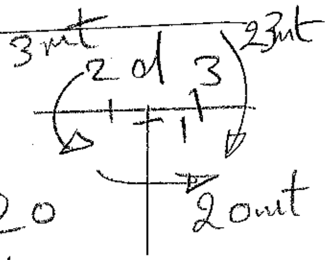
$\therefore \boxed{Y_a = 13.1\,t}$

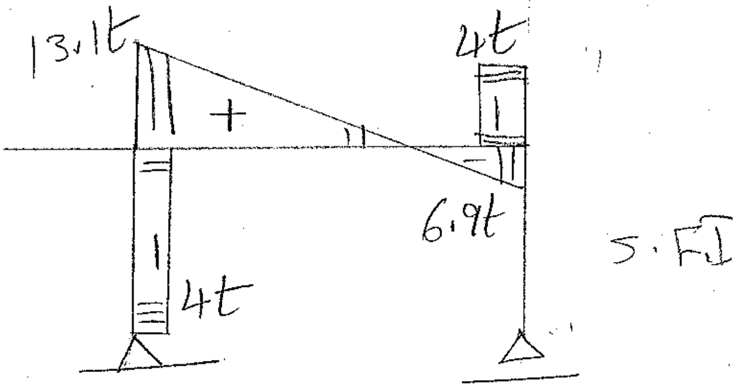


② $\Sigma F_y = 0$

$\therefore 2 \times 10 - 13.1 - Y_b = 0$

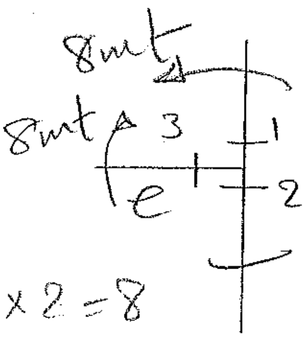
$\therefore \boxed{Y_b = 6.9\,t}$

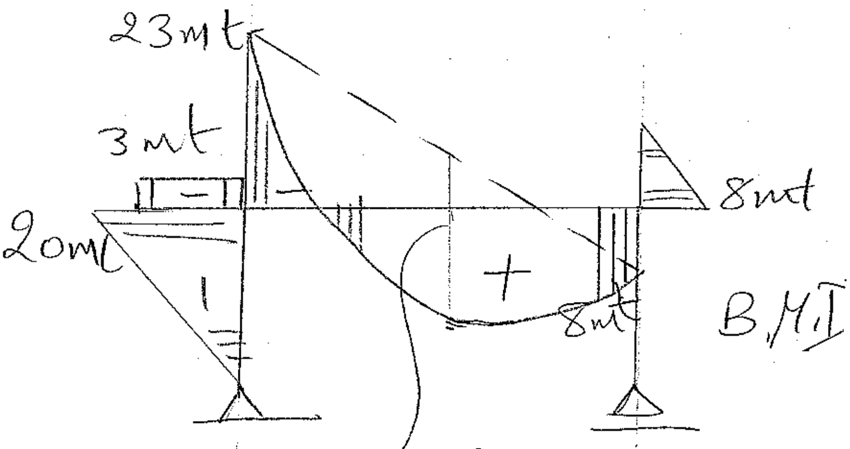




$M_{d_1} = 4 \times 5 = 20$

$M_{d_2} = 3\ mt$





$M_{e_1} = 4 \times 2 = 8$

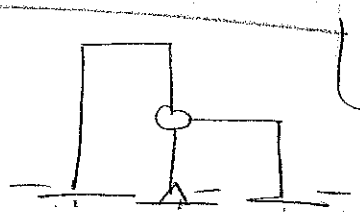
$M_{e_2} = 0$

$\frac{2(10)^2}{8} = 25\,mt$

Q4

$U = 8$

$E = 3 + 2 = 5$



stable ∴

3 times St. Ind.

Higher Technological Institute — Civil Eng. Department

Final Exam -(Sep.-Jan 2016/2017)

Dr.Manal Kamal Zaki — Theory of Structures (2) — CT 112 — Time: $1\frac{1}{2}$ hrs.

Q1

For the shown frame:

1. Find the reactions.
2. Draw the N.F.D., Q.F.D.
3. Draw the B.M.D.

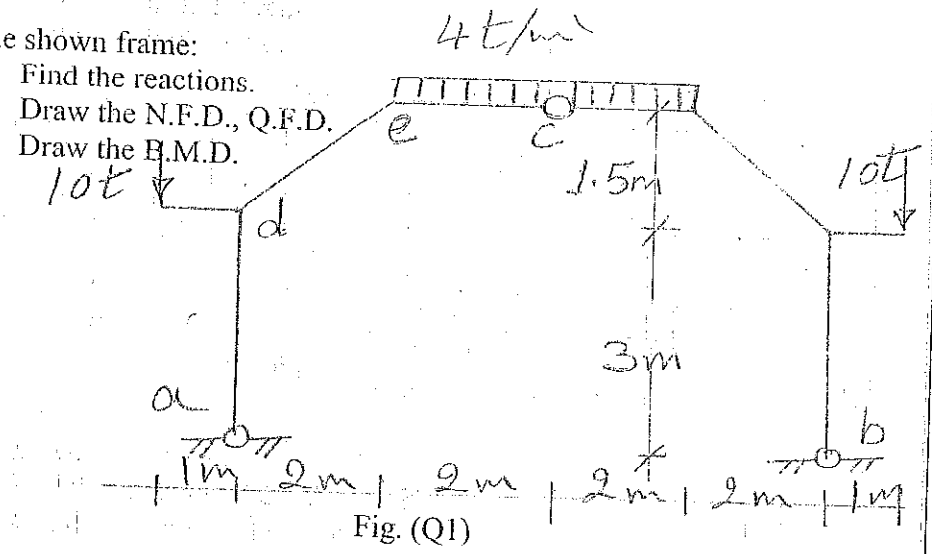


Fig. (Q1)

ILO's		
[a2,d1]	[3 marks]	
[a2]	[8 marks]	
[a2,c1]	[5 marks]	
		[Total 16]

Q2

For the shown truss:

1. Find the reactions.
2. Find the normal forces in the marked members.

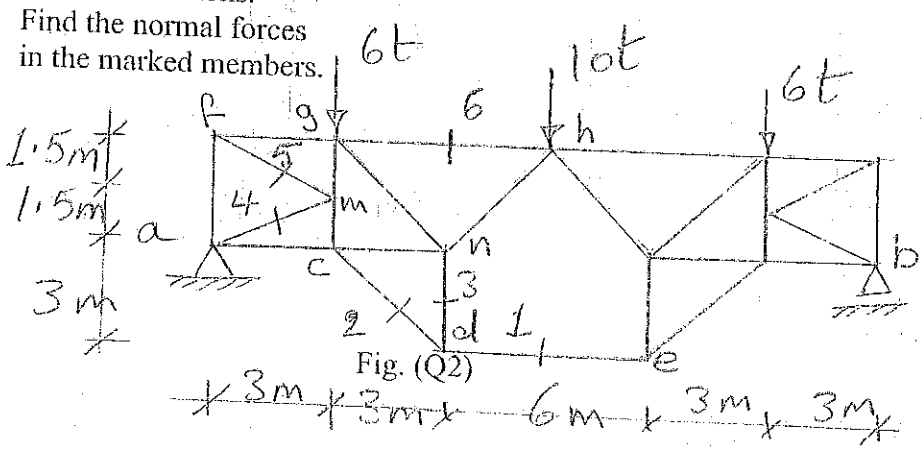


Fig. (Q2)

[a2]	[2 marks]	
[a2,c1]	[10 marks]	
		[Total 12]

Q3

For the shown structures:

1. Find the forces in the link members.
2. And draw the B.M.D. only.

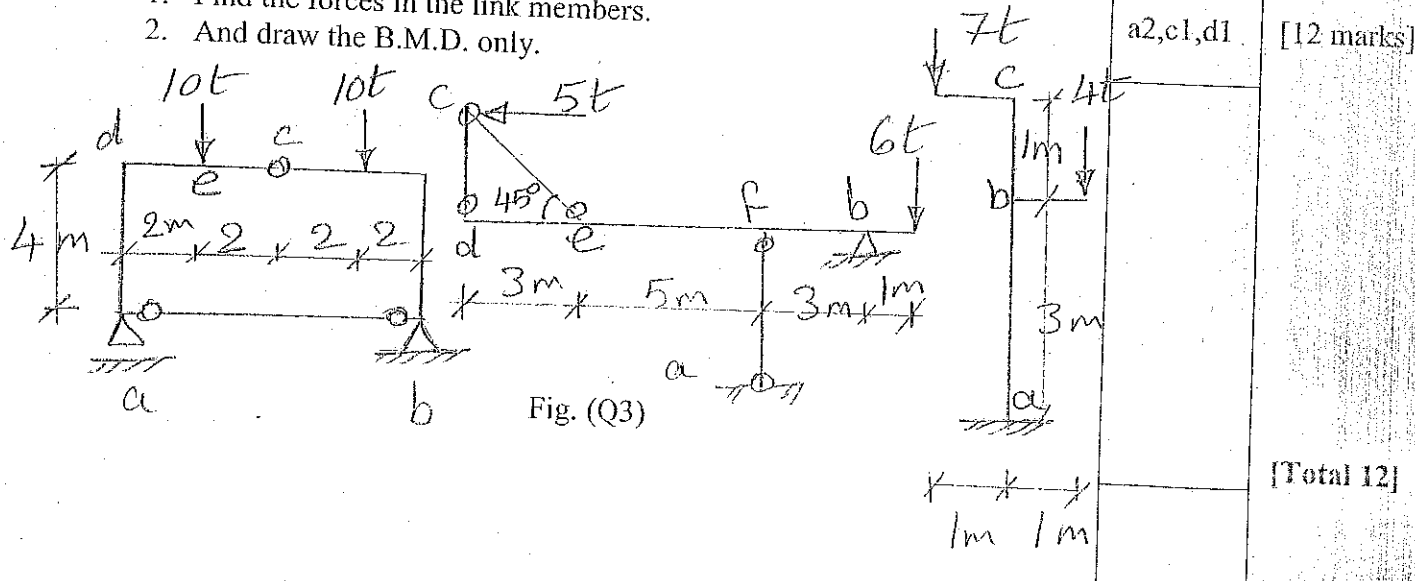


Fig. (Q3)

a2,c1,d1	[12 marks]	
		[Total 12]

Mail:

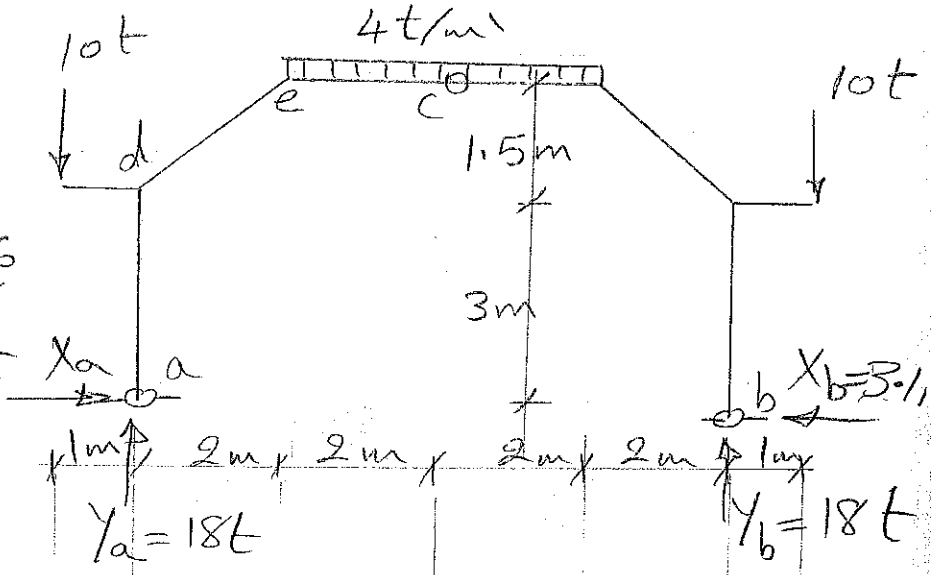
Manal

Q1

$\tan\theta = \frac{1.5}{2} = \frac{3}{4}$

$\therefore \sin\theta = 0.6$

$\cos\theta = 0.8$

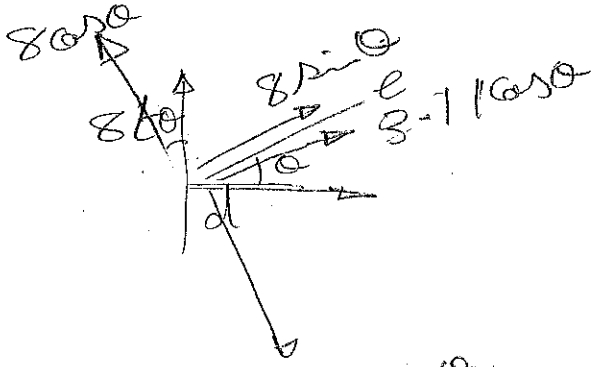


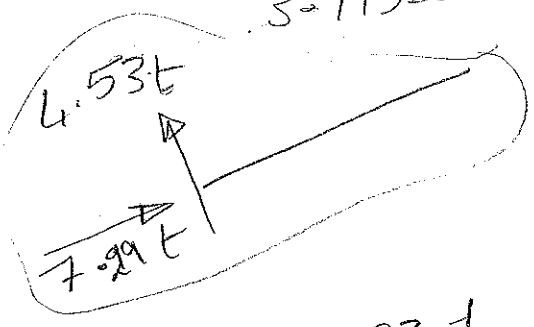
$Y_a = Y_b = 10 + 4 \times 2 = 18t$

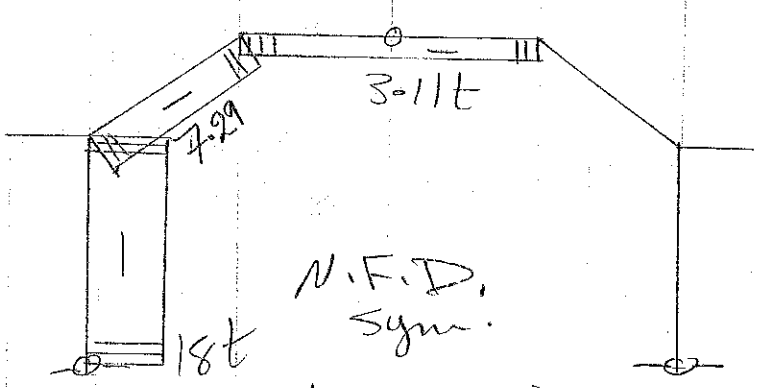
$\Sigma M @ c = 0$ right

$4 \times 2 \times 1 + 10 \times 5 + 4.5 X_b - 4 Y_b = 0$

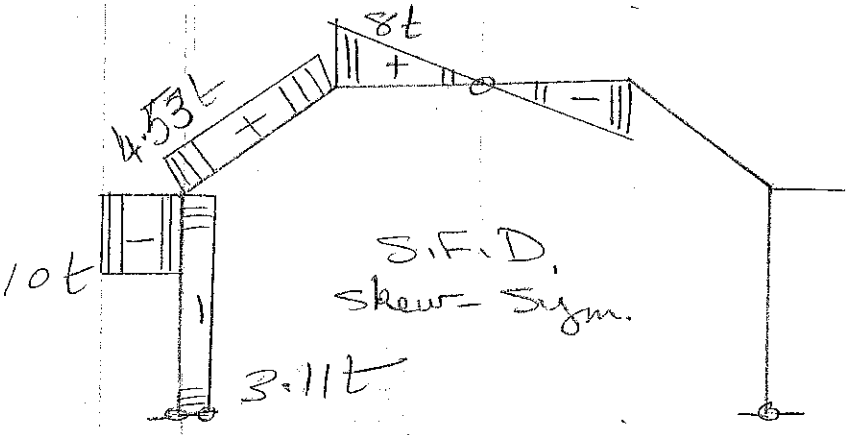
$\therefore X_b = 3.11t$



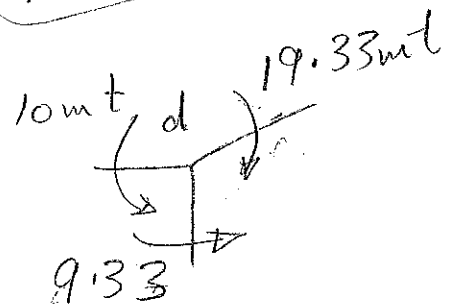


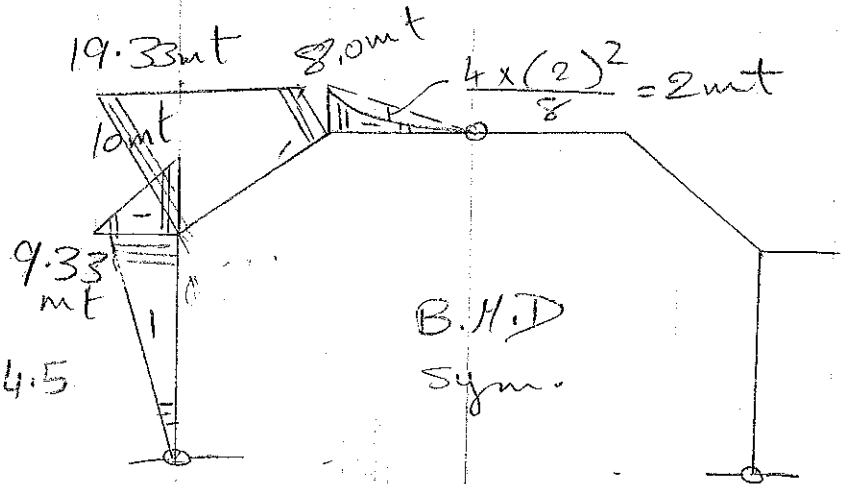


N.F.D.
Sym.



S.F.D.
Skew-Sym.



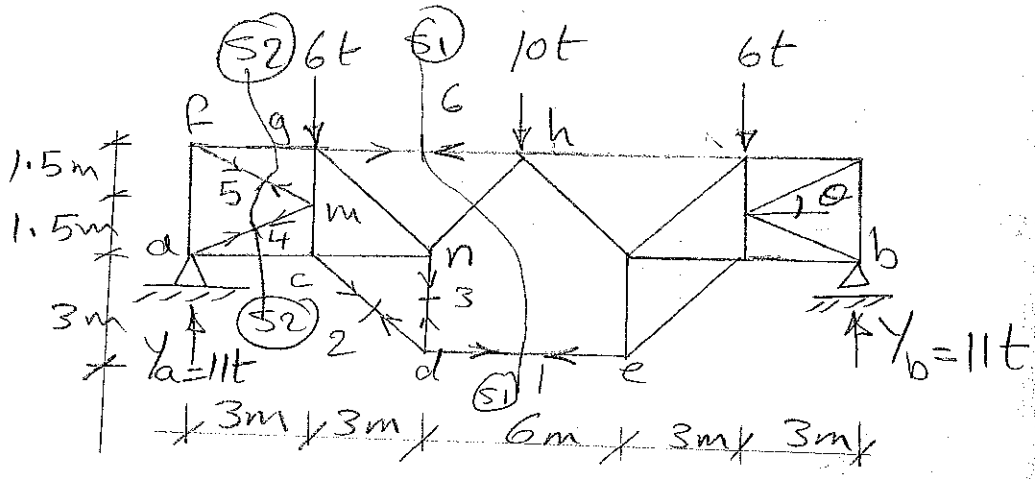


B.M.D
Sym.

$M_e = 18 \times 2 - 10 \times 3 - 3.11 \times 4.5$

$= -8.0$ mt

Q2



$\tan\theta = \frac{1}{2}$

Member 1

Sec S1-S1 – ΣM @ right h = 0

$6F_1 + 6\times6 - 9Y_b = 0$ $\therefore$ $\boxed{F_1 = 10.5}$ tens.

Member 2: Joint d

$\Sigma F_x = 0$

$\therefore F_1 - F_2 \cos 45 = 0$ $\therefore$ $\boxed{F_2 = \frac{F_1}{\cos 45} = 14.85}$ tens

Member 3: Joint d

$\Sigma F_y = 0$

$\therefore F_2 \sin 45 + F_3 = 0$ $\therefore F_3 = -F_2 \sin 45$

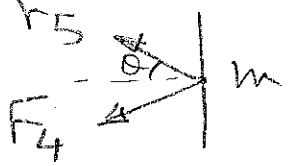
$\therefore$ $\boxed{F_3 = -10.5t}$ comp.

Members F_4 & F_5:

Joint m: $\Sigma F_x = 0$

$\therefore F_4 \cos\theta + F_5 \cos\theta = 0$

$\therefore$ $\boxed{F_4 = -F_5}$



Sec S2-S2: $\Sigma F_y = 0$

$\therefore Y_a + F_4 \sin\theta - F_5 \sin\theta = 0$ $\therefore 11 - 2F_5 \sin\theta =$

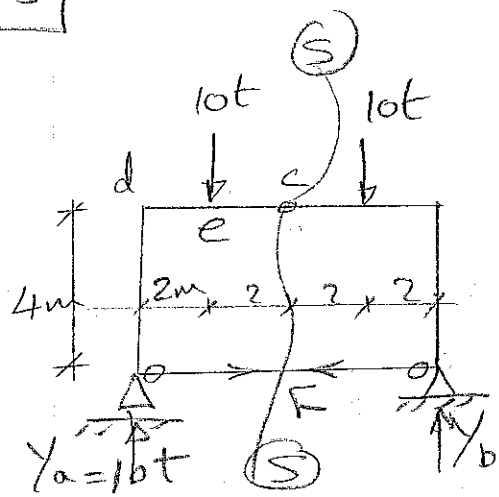
$\therefore$ $\boxed{F_5 = 12.30t}$ tens.

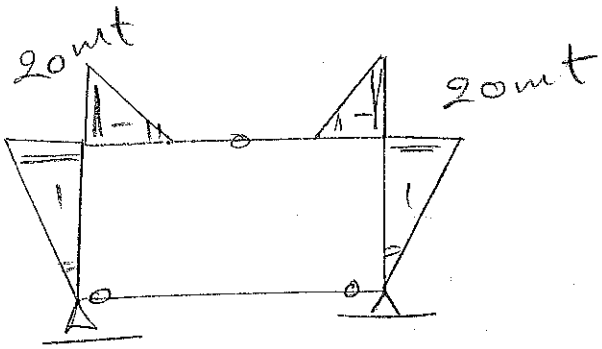
Member 6: Sec S1-S1 – ΣM @ left = 0

$11 * 6 + F_6 * 3 - 6 * 3 - F_1 * 3 = 0$ $\therefore$ $\boxed{F_6 = -5.5t}$

Comp.

Q3





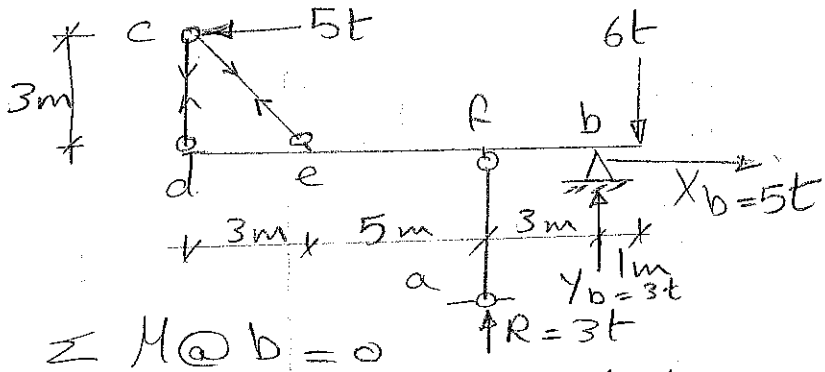
Sec S-S ; ΣM@ c right = 0

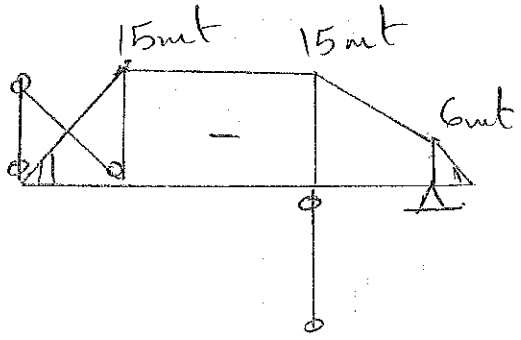
$10 * 4 - 10 * 2 - 4F = 0$

$\therefore$ **F = 5t** tens.

$M_d = -F*4 = -20mt$

$M_e = 10*2 - F*4 = 0$





ΣM@b = 0

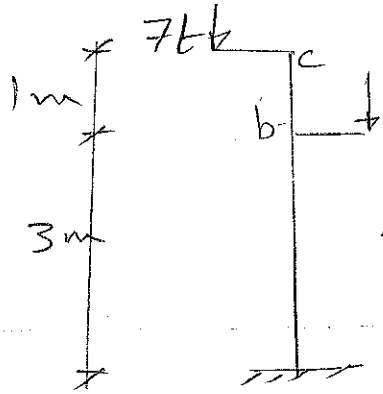
$\therefore 5*3 - 3R - 6*1 = 0$ $\therefore$ **R = 3t** $\therefore$ **Y_b = 3t**

Joint c $\Sigma F_x = 0$ $\therefore F_{c-e}\cos 45 - 5 = 0$ $\therefore$ **F_{c-e} = 7.07t**

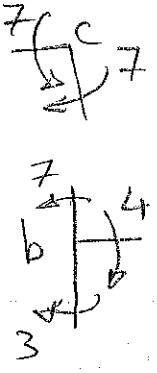
$\Sigma F_y = 0$ $\therefore F_{c-d} + F_{c-d}\sin 45 = 0$ $\therefore$ **F_{c-d} = 5t t**

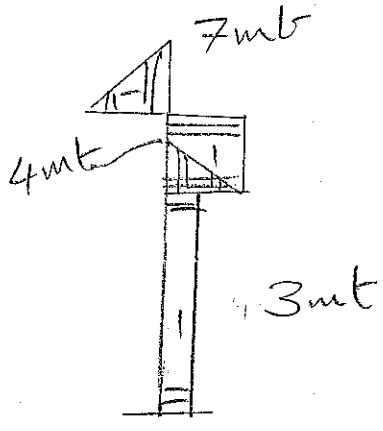
$M_e = 3\times5 + 3\times8 - 6\times9 = -15t$

$M_f = -6\times4 + 3\times3 = -15t$



$M_c = 7\times1$





HIGHER TECHNOLOGICAL INSTITUTE

Civil Engineering Department

Theory of Structures (2)

Time allowed: 1.5 hr.

3rd semester 2016-2017

Final Exam

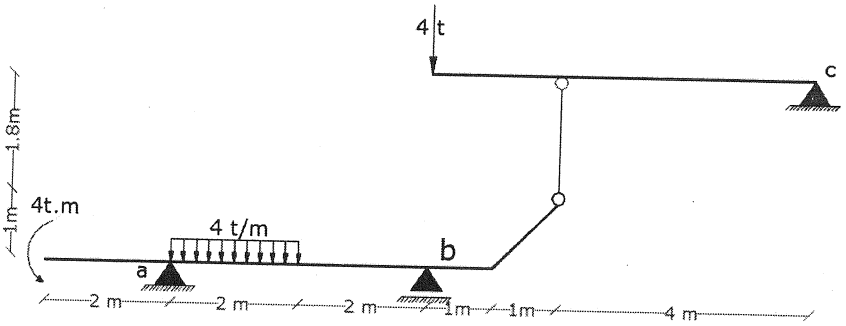
Code : CT112

Examiner: Dr. Ahmed Youssef

***** The exam consists of five questions in two pages attempt all.**

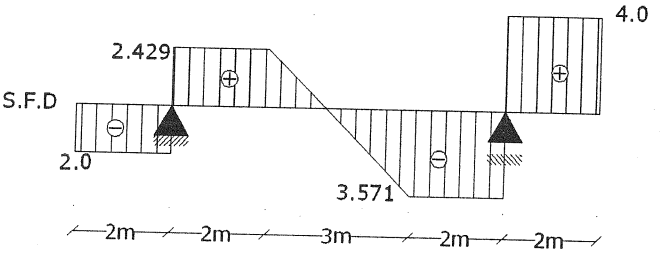
Question (1): a2 ,b2 ,c1,c2 (11 Marks)

Draw the straining action diagrams for the given beam.



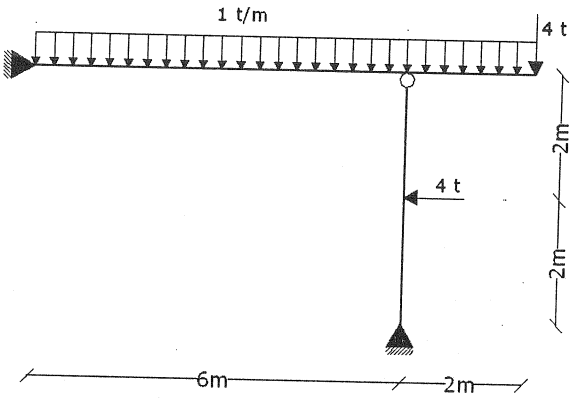
Question (2): a2, b2, c1, c2, d1 (6 Marks)

For the shown shear force diagram deduce the corresponding B.M.D.

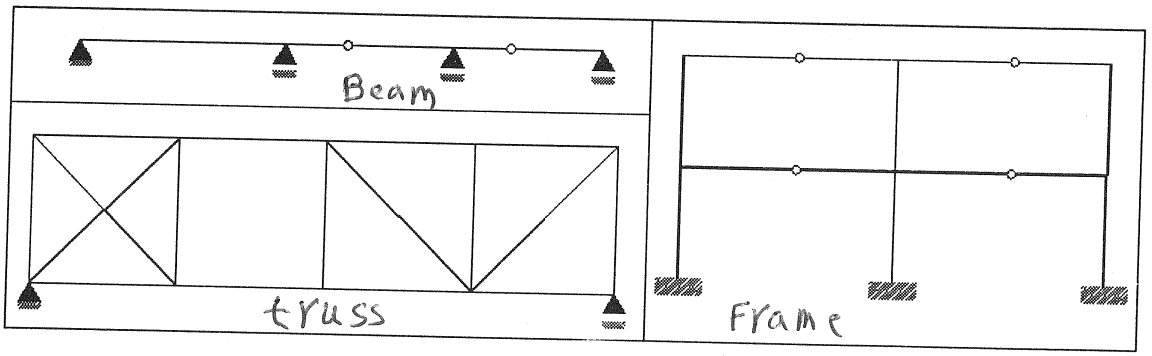


Question (3): a2, b2, c1, c2 (11 Marks)

Draw the straining action Diagrams for the shown frame.

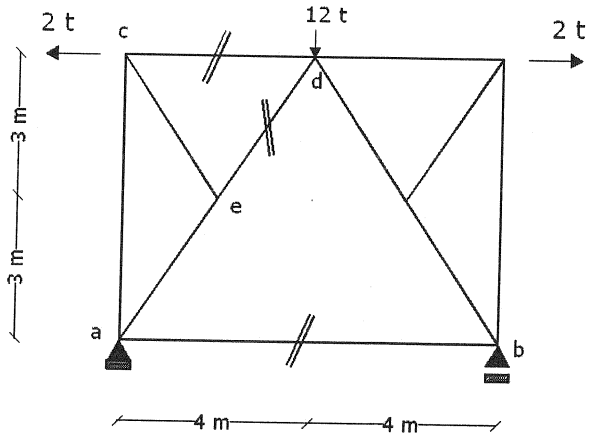


Question (4): a1, b1, d1, d2 (6 Marks) Discuss the stability and determinacy of the shown structures:



Question (5): a1, a2, b2, c1, c2 (9 Marks)

For the shown truss determine the force in the market members.



Best Wishes.

HIGHER TECHNOLOGICAL INSTITUTE | **3rd semester 2016-2017**

Civil Engineering Department | **Final Exam**

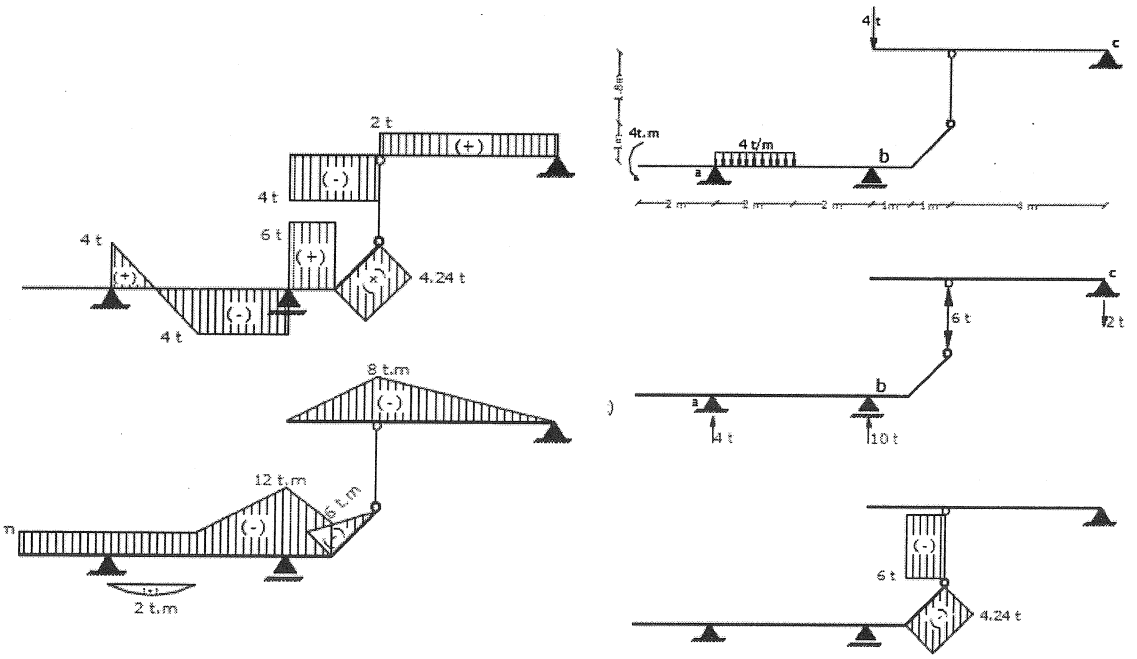
Theory of Structures (2) | **Code : CT112**

Time allowed: 1.5 hr. | **Examiner:** *Dr. Ahmed Youssef*

***** The exam consists of five questions in two pages attempt all.**

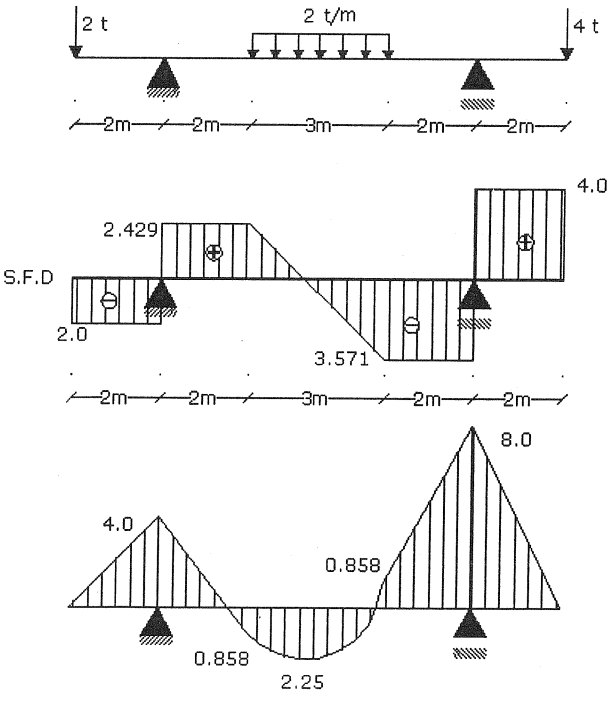
Question (1): (11 Marks)

Draw the straining action diagrams for the given beam.



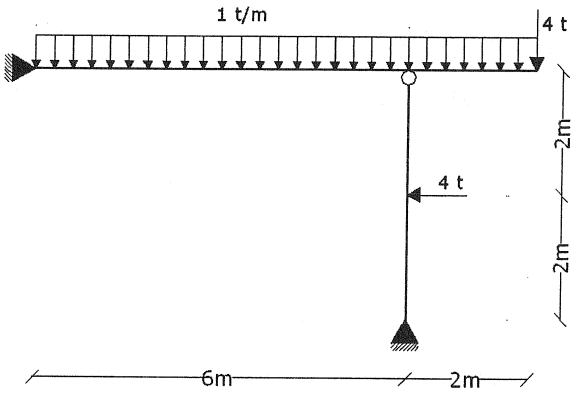
Question (2): (6 Marks)

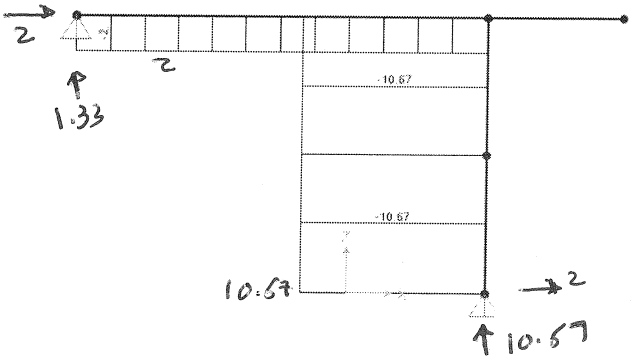
For the shown shear force diagram deduce the corresponding bending moment diagram. (3 marks Loads + 3 B.M.D)

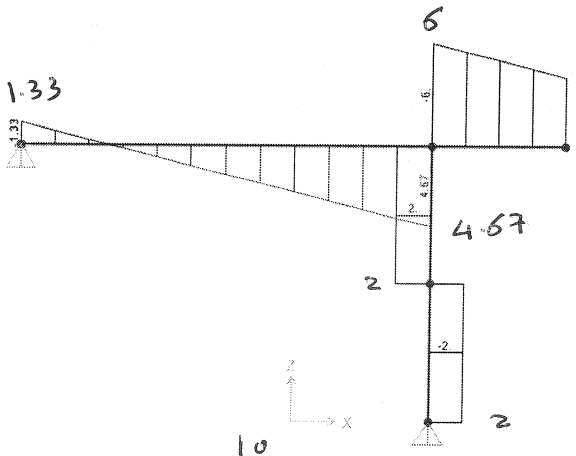


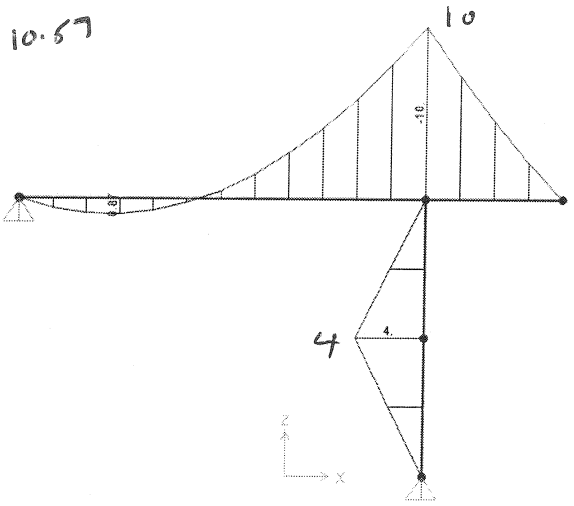
Question (3): (11 Marks)

Draw the straining action Diagrams for the shown frame.









Best Wishes.

QUESTION (4) : (6)

For the beam: (r , 3 +c)

r=5 , C=2 $\quad 5 = 2+3$

∴This beam is statically determinate.

For the Frame: (3m +r , 3j +c)

m= 14 , r=9 , C=4 , J= 13 $\quad (3)(14) +9 > (3)(13)+4$

∴This frame is statically indeterminate (8^{th} degree)

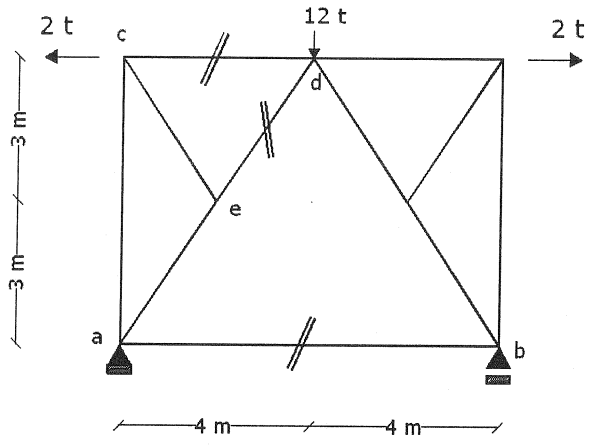
For the Truss: (m +r , 2j)

∴This truss is geometric unstable (since the second panel has not bracing)

QUESTION (5) : (9)

$Y_a = Y_b = 6t$ upward

Cut the structure into two parts.



For the left part:

$\sum M_a=0$

$0= (2)(6) - F_{cd}\ (6)$

$F_{cd} = 2t$ tension

$\sum M_d=0$

$0= (4)(6) - F_{ab}\ (6)$ $\quad F_{ab} = 4t$ tension

$\sum Y=0$

$0= F_{ed} (\sin \theta) + 6$ $\quad F_{ed} = 7.21t$ compression

Best Wishes.