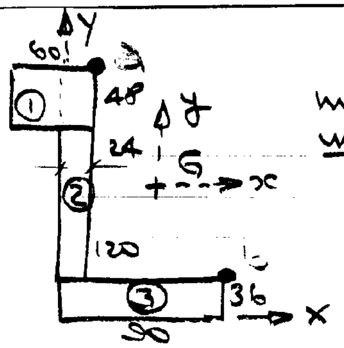
10 Divide into 3 rectangles :- choose X-Y axes.



mm units.

el.	SA	X	Y	XSA	YSA	$x = X-\bar{X}$	$y = Y-\bar{Y}$
1	2880	-6	180	-17280	518400	-24.12	85.2
2	2880	12	96	34560	276480	-6.12	1.2
3	3240	45	18	145800	58320	26.88	-76.8
A = 9000				163080	853200		
A = ΣSA				$\bar{X} = 18.12$	$\bar{Y} = 94.8$		

Hence G, and centroidal x-y axes.

$I_{xx} = \frac{1}{12}[60\times48^3 + 24\times120^3 + 90\times36^3] + 2880(85.2^2 + 1.2^2) + 3240(-76.8)^2$
$= 44\ 379\ 360$ mm^4

$I_{yy} = \frac{1}{12}[48\times60^3 + 120\times24^3 + 36\times90^3] + 2880(24.12^2 + 6.12^2) + 3240\times26.88^2$
$= 7\ 313\ 630$ mm^4

$I_{xy} = 2880(-24.12\times85.2 - 6.12\times1.2) + 3240\times26.88(-76.8)$
$= -12\ 628\ 224$ mm^4

Apply (4) with $M_x = 50$, $M_y = 10$ kNm & x, y in mm.

$\sigma = 1.4500y + 1.1364x$ MPa

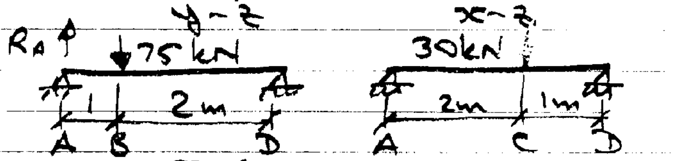
or since X, Y easier & $x = X - 18.12$; $y = Y - 94.8$

$= 1.4500Y + 1.1364X - 158$

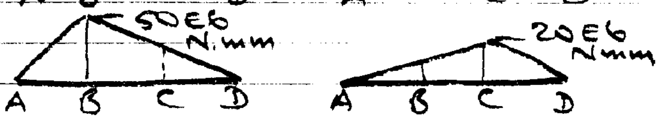
It is found that point B (24, 204) gives highest stress $\sigma_B = 165$ MPa. $\therefore n = 250/165 = \underline{1.52}$

11 compute bending moment components at all potential failure locations i.e. at B & C:

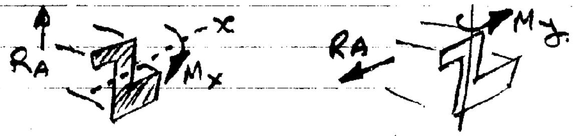
plane of loading y-z x-z



B.M. diagram



Sense of M - RH rule on axis. Both negative to equilibrate R_A.



$M_{Bx} = -50E6$ Nmm $M_{By} = -10E6$ Nmm
$M_{Cx} = -25E6$ Nmm $M_{Cy} = -20E6$ Nmm

Loading at B is just the opposite from problem 8, so, assuming ductile, $n = 1.52$ at B again.
At C, applying (4) with $M_x = -25E6$, $M_y = -20E6$ Nmm

$\sigma = 0.4223y + 3.4638x$
$= 0.4223Y + 3.4638X - 103$

Maximum at point 6 on cross-section 224 MPa
$\therefore n = \text{minimum}(1.52, 250/224) = \underline{1.12}$