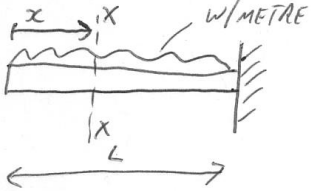


Continuation Sheet

Module/Unit:	STRESS ANALYSIS & DYNAMICS	Page:	1 of 6 (KL)
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Question No	Question	Marks
3 a	 $M_{xx} = -wx \cdot \frac{x}{2}$ $= -\frac{wx^2}{2}$ $\therefore EI \frac{d^2y}{dx^2} = -\frac{wx^2}{2}$ Integrating once $\therefore EI \frac{dy}{dx} = -\frac{wx^3}{6} + A \quad (1)$ Integrating again $\therefore EIy = -\frac{wx^4}{24} + Ax + B \quad (2)$ BOUNDARY CONDITIONS: WHEN $x=L$ $\frac{dy}{dx} = 0$ $\therefore$ FROM (1) $0 = -\frac{wL^3}{6} + A$ $\therefore A = \frac{wL^3}{6}$ 2nd BOUNDARY CONDITION: WHEN $x=L$, $y=0$ $\therefore$ FROM (2) $0 = -\frac{wL^4}{24} + \frac{wL^3}{6}L + B$ $\therefore B = \frac{wL^4}{24} - \frac{wL^4}{6} = -\frac{wL^4}{8}$	(1) (1) (1) (1) (1) (2)

Continuation Sheet

Module/Unit:	STRESS ANALYSIS & DYNAMICS	Page:	2 of 6 (HL)
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Question No	Question	Marks
(b i)	FROM (2) $EIy = -\frac{wx^4}{24} + \frac{wL^3x}{6} - \frac{wL^4}{8}$ $\therefore y = \frac{1}{EI} \left[-\frac{wx^4}{24} + \frac{wL^3x}{6} - \frac{wL^4}{8} \right]$ (2) $EIy = -\frac{wx^4}{24} + \frac{wL^3x}{6} - \frac{wL^4}{8}$ $\therefore EI = \frac{1}{y} \left[-\frac{wx^4}{24} + \frac{wL^3x}{6} - \frac{wL^4}{8} \right]$ Therefore, at mid span $x=2.5m$ $= \frac{1}{-2 \times 10^{-3}} \left[-\frac{200 \times 2.5^4}{24} + \frac{200 \times 5^3 \times 2.5}{6} - \frac{200 \times 5^4}{8} \right]$ $= \frac{1}{-2 \times 10^{-3}} \left[-325.5 + 10416.7 - 15625 \right]$ $= \underline{\underline{2.77 \text{ MPam}^4}}$ (5)	

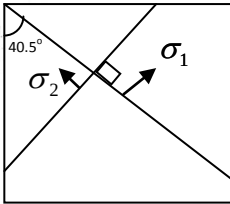
Continuation Sheet

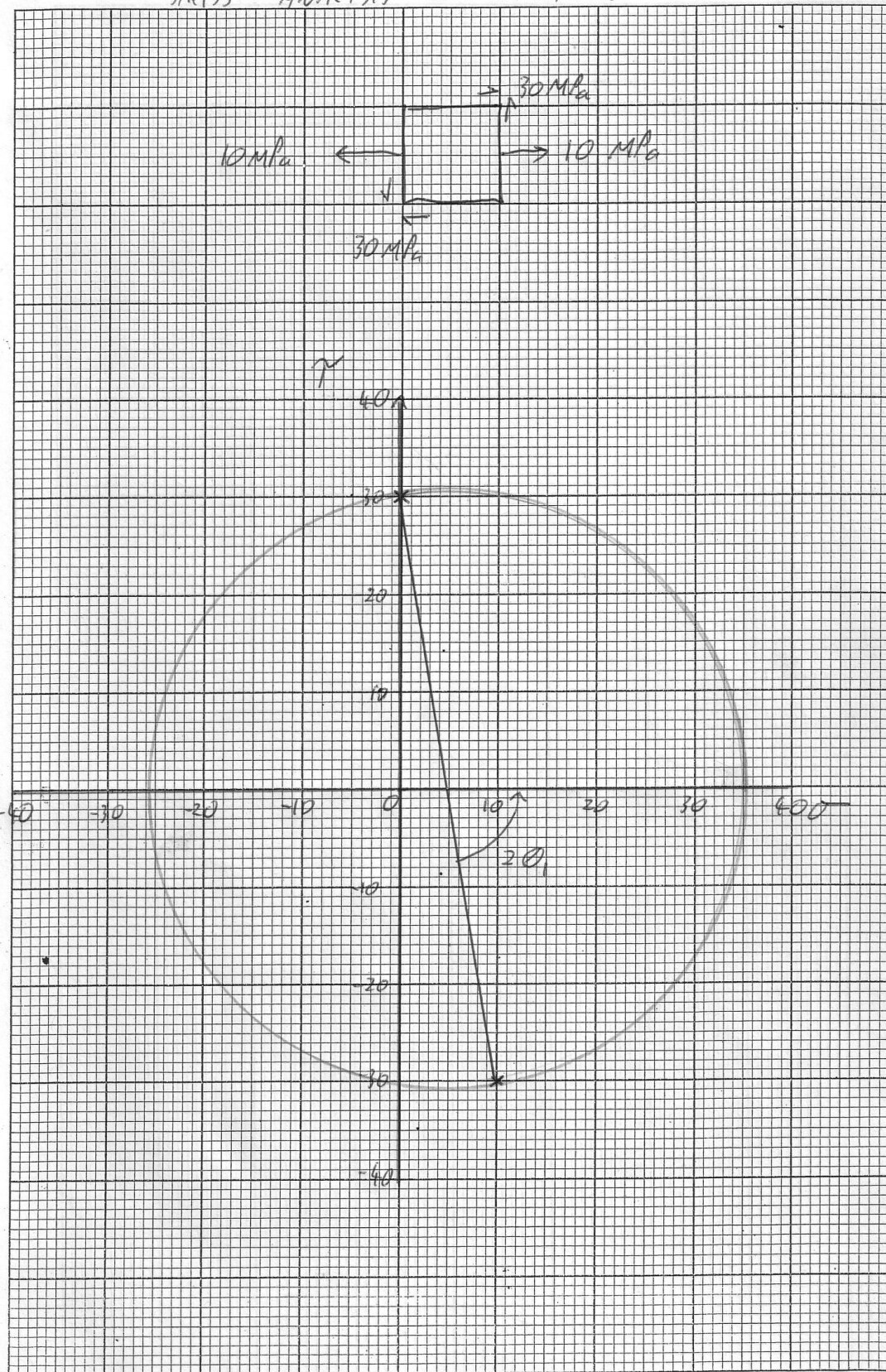
Module/Unit:	STRUTS ANALYSIS & DYNAMICS	Page:	3 of 6 (KL)
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Question No	Question	Marks
(i)	$EI = 2766900$ $\therefore I = \frac{2766900}{69 \times 10^9}$ $= \underline{\underline{4.01 \times 10^{-5} \text{ m}^4}}$	(1)
(iii)	$I = 4.01 \times 10^{-5} \text{ m}^4$ $= (4.01 \times 10^{-5}) \times 10^8$ $= \underline{\underline{4010 \text{ cm}^4}}$ LIGHTEST BEAM IS $D \times B = 312.7 \times 102.4$ $I_{xx} = 6487 \text{ cm}^4$ $\text{WEIGHT} = 33 \text{ kg/m}$ $\therefore \text{WEIGHT OF BEAM IS } 5 \times 33 = \underline{\underline{165 \text{ kg}}}$	(4) 20

Continuation Sheet

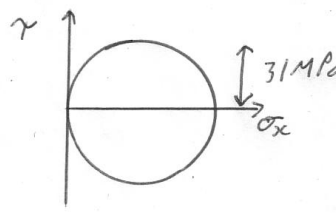
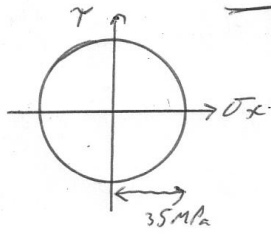
Module/Unit:	STRESS ANALYSIS & DYNAMICS	Page:	4 of 6 (KL)
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Question No	Question	Marks
(4) a	A principal stress is the MAX or MIN value of stress that a loaded section will see. These occur on principal planes which are angled surfaces to the mutually perpendicular calculated stresses	(3)
(6) i	SEE MOHR'S CIRCLE ON NEXT PAGE.	(5)
ii	BY MEASUREMENT $\sigma_1 \approx 35 \text{ MPa (TENSILE)}$ $\sigma_2 \approx -26 \text{ MPa (COMPRESSIVE)}$	(1) (1)
	$2\theta_1 \approx 81^\circ$ $\therefore \theta_1 = 40.5^\circ$ MAX PRINCIPAL STRESS	(1)
	$\therefore \theta_2 = 40.5 + 90$ $= 130.5^\circ$ MIN PRINCIPAL STRESS	(1)
iii	$\tau_{max} \approx 31 \text{ MPa}$ $\theta = 40.5 + 45$ $= 85.5^\circ$	(1) (1)
	 (Sketch not necessary)	



Continuation Sheet

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Question No	Question	Marks
(iv)	σ_x ONLY $\sigma_y = 0$ $\tau_{xy} = 0$ $\tau_{max} = 31 \text{ MPa}$ $\therefore$ RADIUS OF CIRCLE IS $31 \text{ MPa} \therefore \sigma_1 = 62 \text{ MPa}$ 	(3)
(v)	$\sigma_x = 0$ $\sigma_y = 0$ $\sigma_1 = 35 \text{ MPa}$ $\therefore$ RADIUS OF CIRCLE IS $35 \text{ MPa} \therefore \tau_{xy} = 35 \text{ MPa}$ 	(3) 20