

## 九十九學年四技二專第五次聯合模擬考試 土木與建築群 專業科目 (一) 詳解

99-5-06-4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	B	A	B	B	D	C	B	C	C	C	A	D	A	B	D	C	D	A	A
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
B	C	C	D	D	A	D	A	B	C	A	B	D	B	C	D	B	A	C	C

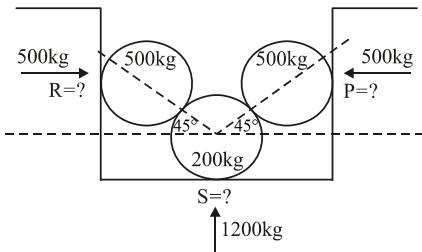
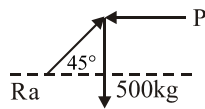
### 第一部份：工程力學

3. 取右邊自由體圖，求 P 跟 Ra

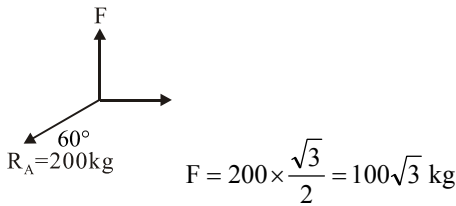
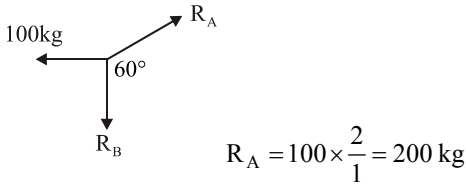
$P = 500 \text{ kg}$

$R_a = 500 \times \frac{\sqrt{2}}{1} = 500\sqrt{2}$

得  $P = 500 \text{ kg}$ ，便可得知  $R = 500 \text{ kg}$   
而  $S = 1200 \text{ kg}$



4. 取自由體圖



5.	My	F	形心	Mx
	-40	-20	(2 4)	-80
	-50	-10	(5 2)	-20
	90	30	(3 -2)	-60
	0	0	0 0	-160

6.  $L = \sqrt{4^2 + 3^2 + 12^2} = 13$

$F_x = 260 \times \frac{12}{13} = 240$ ， $F_z = 260 \times \frac{3}{13} = 60$

$(+) \sum M_y = 240 \times 3 + 60 \times 1 = 780 \text{ kg-cm}$

7.  $I_G = \frac{bh^3}{36} = \frac{9 \times 12^3}{36} = 432 \text{ cm}^4$

$I = I_G + Ay^2 = 432 + 54 \times 10^2 = 5832 \text{ cm}^4$

8. 先假設原點於 1/4 圓圓心

	$A_x$	+ 面積	形心	$A_y$
正方形	500	100	(5 5)	500
1/4 圓	-72	$9\pi$	$(\frac{4}{3\pi} \frac{4}{3\pi})$	-72
	428	71.74	(5.96 5.96)	428

$X = 10 - 5.96 = 4.04 \text{ cm}$

$Y = 5.96 \text{ cm}$

9.  $\phi = \tan^{-1} 0.577 = 30^\circ$

$P_{\min} = 100 \times \sin(\theta + \phi) = 100 \times \sin(30^\circ + 30^\circ)$   
 $= 100 \times \sin(60^\circ) = 86.6 \text{ kg}$

10.  $\sum M_a = 0$  順+， $100 \times 6 + 0.25P_b \times 12 - P_b \times 18 = 0$   
 $600 - 15P_b = 0$ ， $P_b = 40$ ， $F_b = 10$

$\sum F_y = 0$  下+， $100 + 10 - P_a = 0$ ， $P_a = 110$ ， $F_a = 55$   
 $P = 95 \text{ kg}$

11. 蒲松比 =  $\frac{v_{\text{橫}}}{v_{\text{縱}}} = \frac{0.005}{\frac{15}{0.05}} = 0.2$

12.  $\delta_t = \delta_c$  (a 點上方受拉伸長 = a 點下方受壓縮短)

$\frac{(Q-P)(\frac{L}{4})}{(AE)} = \frac{PL}{(AE)}$ ， $\therefore \frac{P}{Q} = \frac{1}{5}$

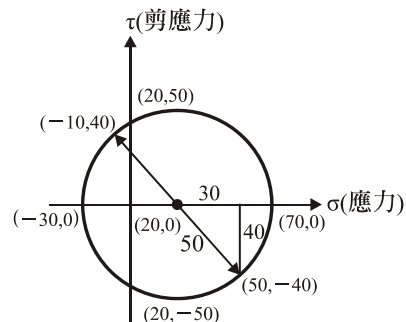
13.  $\epsilon = \frac{0.5}{10} = 0.05$ ， $G = \frac{\tau}{\epsilon}$ ， $0.84 \times 10^6 = \frac{\tau}{0.05}$ ， $\tau = 4.2 \times 10^4$

14.  $\sigma = \frac{Ey}{\rho} = \frac{2 \times 10^6 \times 0.05}{100} = 1000 \text{ kg/cm}^2$

15. 畫莫耳圓找圓心、半徑

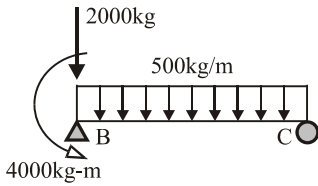
圓心 =  $(\frac{50 + (-10)}{2}, \frac{40 + (-40)}{2}) = (20, 0)$

半徑 =  $\frac{\sqrt{(50 - (-10))^2 + (40 - (-40))^2}}{2} = 50$



$$\tan^{-1} \frac{40}{30} = 53^\circ, \quad \frac{53^\circ}{2} = 26.5^\circ$$

18. 先將力到 B 點，求 C 點轉角



$$\theta_C = \frac{wl^3}{24EI} - \frac{ml}{6EI} = \frac{500 \times 4^3}{24EI} - \frac{4000 \times 4}{6EI} = -\frac{4000}{3EI}$$

$$\delta_D = 3 \times \theta_C, \quad \delta_D = 1 \times \theta = 3 \times \frac{4000}{3EI} = \frac{4000}{EI} \text{ m}$$

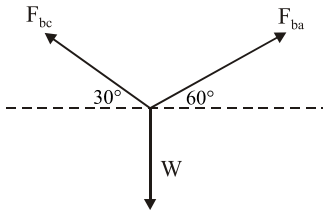
19.  $\sum M_b = 0$  順正

$$100\sqrt{3}l + 100l - R_d \times (\sqrt{3}l + l) = 0$$

$R_d = 100 \uparrow$ ,  $R_b = 100 \leftarrow$ , 因此 bc 為零桿

gc 應為零力桿，及 FC 為零桿，共三根

20. 由比例得知左邊角度為 60 度，取自由體圖



$$F_{bc} = \frac{w \cos 60^\circ}{\sin 90^\circ} = 0.5 w$$

$$F_{bc} = 0.5 w \cos 30^\circ = \frac{\sqrt{3}}{4} w$$

## 第二部份：工程材料

21. 彈性係數不是保水性質重要之參數，含水率及吸水率是以百分比表示

22. FRP 是玻璃纖維強化塑膠，ISO 是國際標準化機構

27. FM 值 =  $\frac{214}{100} = 2.14$

篩號 (標準篩號)	停留重量 (克)	停留重量 百分比(%)	累積重量 百分比(%)
#4	40	4	4
#8	40	4	8
#16	100	10	18
#30	260	26	44
#50	10	1	45
#100	500	50	95
底盤	50	5	
總計	1000	100	214

CNS 規範細骨材之 FM 值為 2.3~3.1

29. 大理石是屬變質岩，石灰岩是屬水成岩，石材之「才」是體積單位為 1 尺<sup>3</sup>，面積單位則為 1 尺<sup>2</sup>

32. 與年輪成對角線之正方形角材，收縮後橫斷面會變成菱形

33. 焦油因不同粘度及硬度可分為 12 級