

九十九學年四技二專第二次聯合模擬考試 土木與建築群 專業科目(一) 詳解

99-2-06-4

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

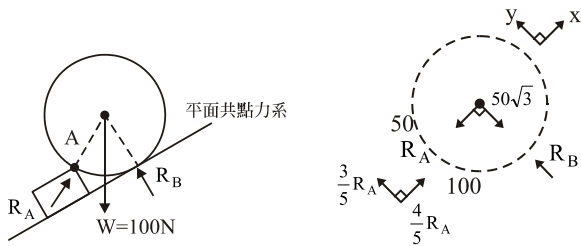
第一部份：工程力學

1. 拘束向量於材料力學中討論
2. 平面共點力系，平衡方程式兩個，未知數不得超過兩個

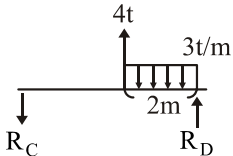
3. $\Sigma F_x = 0$, $\frac{4}{5}R_A = 50$, $R_A = 62.5\text{ N}$

$\Sigma F_y = 0$, $50\sqrt{3} = R_B + \frac{3}{5}R_A = R_B + \frac{3}{5} \times 62.5$

$\therefore R_B = 49.1\text{ N}$

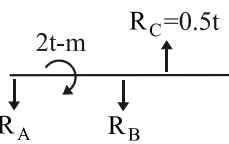


4. 重疊梁先取 CD 梁



由 $\Sigma M_D = 0$, 得 $4R_C + 6 \times 1 = 4 \times 2$, $R_C = 0.5\text{ t}$

再取 AB 梁



由 $\Sigma M_A = 0$, 得 $2 + 5R_B = 0.5 \times 7$, $5R_B = 1.5$

$R_B = 0.3\text{ t}$

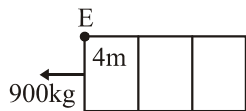
5. $\Sigma M_A = 0$, 得 $7R_C + 100 \times 2 = 44 \times 9 + 90 \times 2$

$R_C = 53.7\text{ kg}$

6. 此為一單力和兩力偶，化簡為一單力 $F = 900\text{ kg} (\leftarrow)$

及 $C = 400 \times 14 - 200 \times 10 = 3600\text{ kg}\cdot\text{m} (\curvearrow)$

在 E 點作一大小相等，方向相反 $900\text{ kg} (\rightarrow)$ ，並作出一力偶 $C = 3600\text{ kg}\cdot\text{m} (\curvearrow)$ ，則力偶之另一單力向下移動 4 m

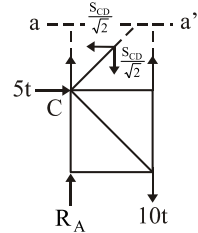


7. 截面法切 aa' 斷面

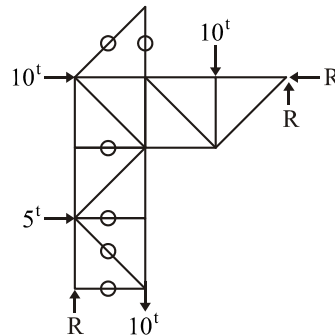
$\Sigma F_x = 0$

$5 = \frac{S_{CD}}{\sqrt{2}}$

$S_{CD} = 5\sqrt{2}\text{ t (壓力)}$



8. 零桿件

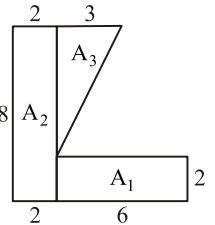


零桿 6 根

9. 形心 (\bar{x}, \bar{y})

$\bar{x} = \frac{12 \times 5 + 16 \times 1 + 9 \times 3}{12 + 16 + 9} = 2.78\text{ cm}$

$\bar{y} = \frac{12 \times 1 + 16 \times 4 + 9 \times 6}{12 + 16 + 9} = 3.51\text{ cm}$



10. $I_x = \frac{6 \times 2^3}{3} + \frac{2 \times 8^3}{3} + (\frac{3 \times 6^3}{36} + 9 \times 6^2) = 699.3\text{ cm}^4$

11. $F = 39\text{ kg}$ 分解為 $\begin{cases} f_x = 39 \times \frac{12}{\sqrt{3^2 + 4^2 + 12^2}} = 36\text{ kg} (\rightarrow) \\ f_y = 39 \times \frac{12}{\sqrt{3^2 + 4^2 + 12^2}} = 12\text{ kg} (\uparrow) \\ f_z = 39 \times \frac{3}{\sqrt{3^2 + 4^2 + 12^2}} = 9\text{ kg} (\nearrow) \end{cases}$

$F = 25\text{ kg}$ 分解為 $\begin{cases} f_x = 25 \times \frac{0}{\sqrt{3^2 + 4^2 + 0^2}} = 0 \\ f_y = 25 \times \frac{4}{5} = 20\text{ kg} (\downarrow) \\ f_z = 25 \times \frac{3}{5} = 15\text{ kg} (\swarrow) \end{cases}$

$\therefore \Sigma F_x = 36 + 0 = 36\text{ kg} (\rightarrow)$, $\Sigma F_y = 20 - 12 = 8\text{ kg} (\downarrow)$

$\Sigma F_z = 15 - 9 = 6\text{ kg} (\swarrow)$

合力 $R = \sqrt{36^2 + 8^2 + 6^2} = 37.4\text{ kg}$

12. $f = \mu \cdot N$

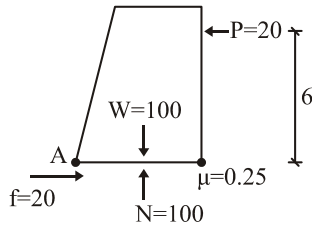
摩擦力與面積大小無關

13. 當 $P = 20 \text{ kg}$ 時

$$M_A = 20 \times 6 - 100 \times 1$$

$$= 120 - 100$$

$$= 20 \text{ kg-m (傾倒)}$$



14. $\delta = \frac{Pl}{AE} = \frac{10^5 \pi \times 20}{\frac{\pi \cdot 4^2}{4} \times 2 \times 10^6} = 0.25 \text{ cm}$

因 $\mu = 0.25 = \frac{E_{\text{橫}}}{E_{\text{縱}}} \cdot \frac{\delta}{0.25}$, 得 $\delta = 0.0125 \text{ cm}$

所以直徑 D 受拉力後 $D = 4 - 0.0125 = 3.9875 \text{ cm}$

16. 熱伸長量 $\delta = \alpha \cdot l \cdot \Delta T = 0.0015 \times 300 \times 20 = 9 \text{ cm}$

由於空隙 6 cm , 熱伸長只有 3 cm 受壓

由 $\delta = \sigma \cdot \frac{l}{E}$, $3 = \sigma \times \frac{300}{2 \times 10^4}$, $\sigma = 200 \text{ kg/cm}^2$

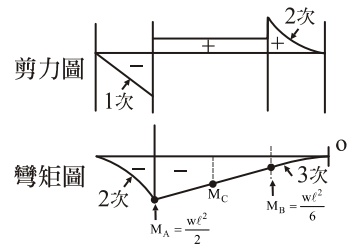
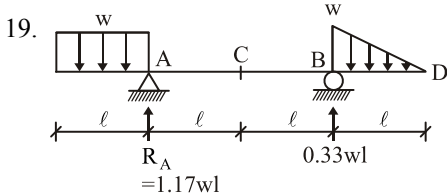
17. $\sigma_\theta = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \cos 2\theta - \tau_{xy} \sin 2\theta$

$$= \frac{-20 + 50}{2} + \frac{-20 - 50}{2} \cos 120 = 32.5 \text{ kg/cm}^2$$

$\tau_\theta = \frac{\sigma_x - \sigma_y}{2} \sin 2\theta = \frac{-20 - 50}{2} \sin 120$

$$= -30.3 \text{ kg/cm}^2$$

18. $\tau = \frac{P}{A} = \frac{12000}{3 \times 2 \times \frac{\pi \cdot 4^2}{4}} = \frac{500}{\pi} \text{ kg/cm}^2$



20. $M_C = \frac{-wl^2}{2} + 0.17wl \times l = -0.33wl^2$

26. 火成岩：花崗石、安山岩
 水成岩：石灰岩、凝灰岩、頁岩
 變質岩：石英岩、片麻岩

30. 吸水率

$$= \frac{\text{S.S.D} - \text{O.D}}{\text{O.D}} \times 100\% = \frac{410 - 400}{400} \times 100\% = 2.5\%$$

含水率

$$= \frac{W_{\text{試樣重}} - \text{O.D}}{\text{O.D}} \times 100\% = \frac{407 - 400}{400} \times 100\% = 1.75\%$$

吸水量 = S.S.D - O.D = 410 - 400 = 10 g

表面含水量 = Wet - S.S.D = 415 - 410 = 5 g

32. 磚窯中以隧道窯燒製較省燃料且製程最快

33. 牆面積為 $(420 - 30) \times 300 = 117,000 \text{ cm}^2$

依 CNS 標準單塊 $\frac{1}{2}B$ 之斷面為

$$(23 + 1) \times (6 + 1) = 168 \text{ cm}^2$$

所需磚塊數 $\div \frac{117,000}{168} = 696$ 塊, 再加耗損約為 750 塊

34. 壓花玻璃平滑面在外側防積灰塵

38. 木材材積為：1 才 = 1 寸 \times 1 寸 \times 10 尺

2 支 $\times (1.5 \times 1.5 \times 0.5) = 2.25$ 才

2 支 $\times (1.5 \times 1.0 \times 0.6) = 1.8$ 才

四支合計為 $2.25 + 1.8 = 4.05$ 才

第二部份：工程材料

21. 疲勞為材料力學性質
22. 美國土木工程學會：ASCE
23. 白水泥是將水泥中 Fe_2O_3 含量降低
24. 篩析及格, F.M 一定及格; F.M 及格, 級配不一定及格
25. 倉庫地板須高 30 公分以上, 鋪設油毛氈或塑膠布, 避免水泥吸收水氣, 四周不留窗戶, 減少風化