

112 學年度四技二專第一次聯合模擬考試 機械群 專業科目(一) 詳解

112-1-01-4

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

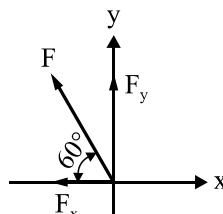
1. (D) 兩摩擦輪間是屬於直接接觸傳動
2. (A) 兩漸開線齒輪嚙合傳動，輪齒的接觸型式屬於線接觸
3. 桿件數為 6，對偶數為 7

$$P = \frac{3}{2}N - 2$$
 故為拘束運動鏈
5. (A) 導程角 α 可表為 $\alpha = \tan^{-1} \frac{1}{5\pi}$
 (C) 螺紋角 θ 為 60°
 (D) 導程角 α 與螺旋角 β 可表為 $\alpha + \beta = 90^\circ$
6. (A) 國際公制標準螺紋
 (B) 左旋四線螺紋
 (C) 公稱外徑為 32 mm
 (D) 導程 $L = nP = 4 \times 6 = 24$ mm
7. (C) 滾珠螺紋屬於傳動用螺紋；圓螺紋屬於連接用螺紋
8. $F \times 2\pi R \times \eta = W \times L$

$$\eta = \frac{W \times L}{F \times 2\pi R} = \frac{4800\pi \times 8}{120 \times 2\pi \times 200}$$
 機械效率 $\eta = \frac{8}{10} = 80\%$
 機械利益 $M = \frac{W}{F} = \frac{4800\pi}{120} = 40\pi$
10. (B) 螺旋彈簧鎖緊墊圈屬於摩擦鎖緊裝置
 (C) 彈簧線鎖緊裝置使用時需要在螺栓上鑽一小孔，以使螺旋彈簧線穿入
 (D) 必須配合小螺釘鎖入的鎖緊裝置為螺釘鎖緊裝置
11. (B) 翼形螺帽的二側有片狀伸長，有利於用手操作之經常拆卸處
12. (A) 與此鍵配合的軸上所製作的凹槽稱之為鍵座
 (B) 此鍵承受剪力的面積為 600 mm^2
 (C) 此鍵的高度為 8 mm
 (D) 壓應力 $\sigma = \frac{F}{4 \times 50}$ ，剪應力 $\tau = \frac{F}{12 \times 50}$ ， $\frac{\sigma}{\tau} = \frac{12}{4} = 3$
13. (A) 僅需製作鍵槽，不需製作鍵座
 (B) 靠摩擦力傳動，僅適合小動力傳送
 (D) 適合用於齒輪在軸上作軸向移動的場合為滑鍵或栓槽鍵
14. $\tau = \frac{F}{A}$
 $F = 20 \times 10 \times 25 = 5000 \text{ N}$
 $T = F \times R = 5000 \times 0.03 = 150 \text{ N} \cdot \text{m}$

15. (A) 蝸旋扭轉彈簧常用於儲存能量，亦常稱為發條
16. $W = k \cdot X$ ， $25 = k \times 0.5$ ， $k = 50 \text{ kg/cm}$
 $80 = 50 \cdot X$ ， $X = 1.6 \text{ cm}$
17. 第一層 $K_1 = K + K = 4 \text{ kN/cm}$
 第二層 $K_2 = K + K + K = 6 \text{ kN/cm}$
 $X_1 = \frac{W}{K_1} = \frac{24}{4} = 6 \text{ cm}$ ， $X_2 = \frac{W}{K_2} = \frac{24}{6} = 4 \text{ cm}$
18. (A) 樞軸承屬於軸向軸承
 (B) 多孔軸承需加潤滑油
 (D) 環止推軸承屬於滑動軸承
20. (C) 萬向接頭用於兩軸心相交角度小於 30° 的處所
22. (A) $1 \text{ MPa} = 10^6 \text{ N/m}^2 = 1 \text{ N/mm}^2$
23. (D) 外效應是指物體運動狀態的改變
24. 合力 $R = 50 \text{ N}$
 合力偶矩 $C = 50 \times 4 + 20 \times 3 = 260 \text{ N} \cdot \text{m}$

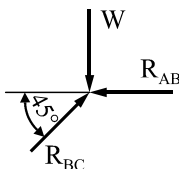
25.



$$F_x = -F \cdot \cos 60^\circ = -100 \times \frac{1}{2} = -50 \text{ N}$$

$$F_y = F \cdot \sin 60^\circ = 100 \times \frac{\sqrt{3}}{2} = 50\sqrt{3} \text{ N}$$

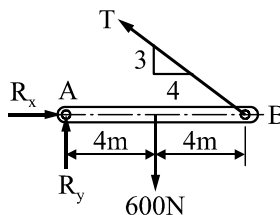
26.



$$\Sigma F_y = 0, R_{BC} \cdot \frac{\sqrt{2}}{2} - W = 0, R_{BC} = \sqrt{2}W$$

$$\Sigma F_x = 0, R_{BC} \cdot \frac{\sqrt{2}}{2} - R_{AB} = 0, R_{AB} = W$$

27.



$$\Sigma M_A = 0$$

$$600 \times 4 - \frac{3}{5} \cdot T \times 8 = 0, T = 500 \text{ N}$$

$$\Sigma F_x = 0$$

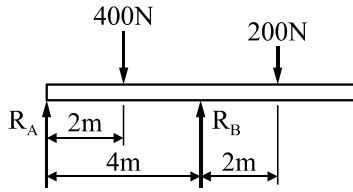
$$R_x - \frac{4}{5} \cdot T = 0, R_x = 400 \text{ N}$$

$$\Sigma F_y = 0$$

$$R_y + \frac{3}{5} \cdot T - 600 = 0, R_y = 300 \text{ N}$$

$$R = \sqrt{R_x^2 + R_y^2} = 500 \text{ N}$$

28.



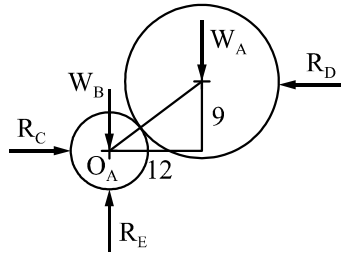
$$\Sigma M_A = 0$$

$$400 \times 2 + 200 \times 6 - 4R_B = 0, R_B = 500 \text{ N}$$

$$\Sigma F_y = 0$$

$$R_A + R_B - 400 - 200 = 0, R_A = 100 \text{ N}$$

29.



$$\Sigma M_{O_A} = 0$$

$$12W_A - 9R_D = 0, 9R_D = 12 \times 600, R_D = 800 \text{ N}$$

$$\Sigma F_x = 0, R_C = R_D = 800 \text{ N}$$

$$\Sigma F_y = 0, R_E = W_A + W_B = 600 + 150 = 750 \text{ N}$$

30.

	重量	x (cm)	y (cm)
m_1	2	-20	150
m_2	4	25	25
m_3	1	300	-10
m_4	3	x_4	y_4
總重量 m	10	$\bar{x} = 0$	$\bar{y} = 0$

$$\bar{x} = \frac{m_1 \cdot x_1 + m_2 \cdot x_2 + m_3 \cdot x_3 + m_4 \cdot x_4}{m}$$

$$0 = \frac{2 \times (-20) + 4 \times 25 + 1 \times 300 + 3 \cdot x_4}{10}$$

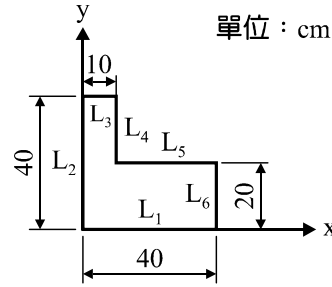
$$x_4 = -120 \text{ cm}$$

$$\bar{y} = \frac{m_1 \cdot y_1 + m_2 \cdot y_2 + m_3 \cdot y_3 + m_4 \cdot y_4}{m}$$

$$0 = \frac{2 \times 150 + 4 \times 25 + 1 \times (-10) + 3 \cdot y_4}{10}$$

$$y_4 = -130 \text{ cm}$$

31.



	長度	x (cm)	y (cm)
L_1	40	20	0
L_2	40	0	20
L_3	10	5	40
L_4	20	10	30
L_5	30	25	20
L_6	20	40	10
總長度 cm	160	\bar{x}	\bar{y}

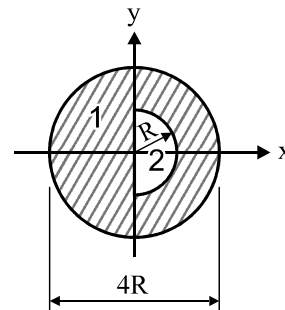
$$\bar{x} = \frac{40 \times 20 + 40 \times 0 + 10 \times 5 + 20 \times 10 + 30 \times 25 + 20 \times 40}{160}$$

$$\bar{x} = 16.25 \text{ cm}$$

$$\bar{y} = \frac{40 \times 0 + 40 \times 20 + 10 \times 40 + 20 \times 30 + 30 \times 20 + 20 \times 10}{160}$$

$$\bar{y} = 16.25 \text{ cm}$$

32.

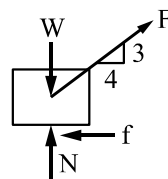


	面積	x (m)
1	$4\pi R^2$	0
2	$-\frac{\pi R^2}{2}$	$\frac{4R}{3\pi}$
總面積	$\frac{7}{2}\pi R^2$	\bar{x}

$$\bar{x} = \frac{4\pi R^2 \times 0 - \frac{\pi R^2}{2} \times \frac{4R}{3\pi}}{\frac{7}{2}\pi R^2}, \bar{x} = -\frac{4R}{21\pi} \text{ m}$$

33. (C) $\theta = 45^\circ$ 與摩擦係數 μ 無關

34.



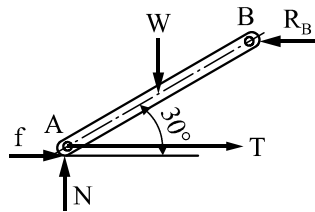
$$N = W - \frac{3}{5}F = 540 - \frac{3}{5} \times 300 = 360 \text{ N}$$

$$\text{最大靜摩擦力: } f = \mu \cdot N = 0.4 \times 360 = 144 \text{ N}$$

水平拉力： $F_x = \frac{4}{5} \times 300 = 240 \text{ N}$

水平拉力大於最大靜摩擦力，故物體開始滑動

35.



$$\Sigma M_A = 0$$

$$W \cdot \frac{L}{2} \cdot \cos 30^\circ - R_B \cdot L \cdot \sin 30^\circ = 0$$

$$100 \times \frac{6}{2} \times \frac{\sqrt{3}}{2} - R_B \times 6 \times \frac{1}{2} = 0$$

$$R_B = 50\sqrt{3} = 86.6 \text{ N}$$

$$\Sigma F_y = 0, N = W = 100 \text{ N}$$

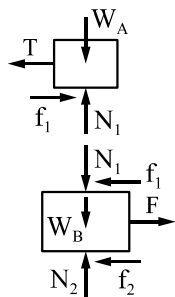
$$f = \mu \cdot N = 0.4 \times 100 = 40 \text{ N}$$

$R_B > f$ ，故即將滑動，繩索受張力 T

$$\Sigma F_x = 0, T + f - R_B = 0$$

$$T = 86.6 - 40 = 46.6 \text{ N}$$

36.



由上圖物體 A 之自由體圖：

$$\Sigma F_y = 0, N_1 = W_A = 100 \text{ N}$$

$$f_1 = 0.4 \times 100 = 40 \text{ N}$$

$$\Sigma F_x = 0, T = f_1 = 40 \text{ N}$$

由下圖物體 B 之自由體圖：

$$\Sigma F_y = 0, N_2 = N_1 + W_B = 400 \text{ N}$$

$$f_2 = 0.4 \times 400 = 160 \text{ N}$$

$$\Sigma F_x = 0, F = f_1 + f_2 = 160 + 40 = 200 \text{ N}$$

37. AB 段速度： $V = \frac{40-0}{5-0} = 8 \text{ m/s}$

BC 段速度： $V = \frac{80-40}{7-5} = 20 \text{ m/s}$

CD 段速度： $V = \frac{100-80}{20-7} = 1\frac{7}{13} \text{ m/s}$

DE 段速度： $V = 0 \text{ m/s}$

38. 甲：斜面長 $S = 20 \text{ m}$

$$t_1 = \sqrt{\frac{2S}{g \cdot \sin \theta}} = \sqrt{\frac{2 \times 20}{10 \times \sin 30^\circ}} = 2\sqrt{2} \text{ sec}$$

乙：

$$t_2 = \sqrt{\frac{2H}{g}} = \sqrt{\frac{2 \times 10}{10}} = \sqrt{2} \text{ sec}$$

$$t_1 - t_2 = 2\sqrt{2} - \sqrt{2} = \sqrt{2} \text{ sec}$$

39. $V = V_0 - gt$

$$V = 20 - 10 \times 10$$

$$V = -80 \text{ m/s (向下)}$$

40. 樓高 H_1

$$0 = H_1 + V_0 \cdot t - \frac{1}{2} \cdot g \cdot t^2$$

$$0 = H_1 + 20 \times 10 - \frac{1}{2} \times 10 \times 10^2$$

$$H_1 = 300 \text{ m}$$

6 秒時第一顆棒球高度 H_2

$$H_2 = 300 + 20 \times 6 - \frac{1}{2} \times 10 \times 6^2$$

$$H_2 = 240 \text{ m}$$

6 秒時第一顆棒球速度 V_2

$$V_2 = V_0 - gt$$

$$V_2 = 20 - 10 \times 6 = -40 \text{ m/s (向下)}$$

兩顆球相遇高度 H_3

$$240 = 40t + \frac{1}{2} \times 10 \times t^2 + 40t - \frac{1}{2} \times 10 \times t^2$$

$$240 = 80t, t = 3 \text{ sec}$$

$$H_3 = 40 \times 3 - \frac{1}{2} \times 10 \times 3^2$$

$$H_3 = 75 \text{ m}$$