

105 學年度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

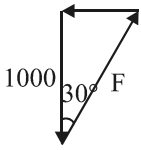
105-5-06-4

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

第一部分：工程力學

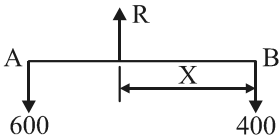
1. (C) 溫度是純量

2.



$$\frac{F}{2} = \frac{1000}{\sqrt{3}}, \quad F = 1154.7 \text{ N}$$

3.



$$R = 600 + 400 = 1000 \text{ N}$$

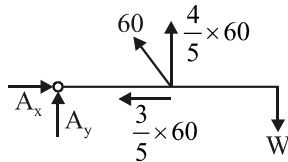
$$\Sigma M_B = 0, \quad RX - 600 \cdot 1 = 0$$

$$X = 0.6 \text{ m}$$

4. $\Sigma M_x = 0$

$$\frac{4}{5} \times 60 \times 50 - W \times 100 = 0$$

$$W = 24 \text{ N}$$



5. $\Delta x = x_2 - x_1 = 10 - (-2) = 12$

$$\Delta y = y_2 - y_1 = 0 - (-3) = 3$$

$$\Delta z = z_2 - z_1 = -2 - (-6) = 4$$

$$R = \sqrt{12^2 + 3^2 + 4^2} = 13$$

$$F_x = \frac{F(\Delta x)}{R} = \frac{780(12)}{13} = 720 \text{ N}$$

$$F_y = \frac{F(\Delta y)}{R} = \frac{780(3)}{13} = 180 \text{ N}$$

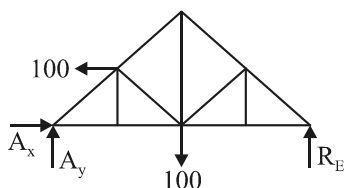
$$F_z = \frac{F(\Delta z)}{R} = \frac{780(4)}{13} = 240 \text{ N}$$

6. $\Sigma F_y = 0, \quad F \sin 60^\circ - 1000 = 0$

$$\frac{\sqrt{3}}{2} F = 1000, \quad F = \frac{2000}{\sqrt{3}} \text{ N}$$

7. (D) 桁架受力均作用於桿件相接之節點上

8.



$$\Sigma F_x = 0, \quad A_x - 100 = 0, \quad A_x = 100$$

$$\Sigma M_E = 0, \quad A_y \times 8 - 100 \times 4 - 100 \times 2 = 0$$

$$A_y = \frac{600}{8} = 75$$

9. $\Sigma F_y = N - W - P \sin \theta = 0$

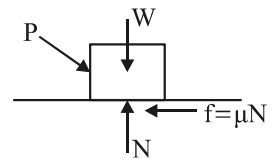
$$N = W + P \sin \theta$$

$$\Sigma F_x = P \cos \theta - \mu N = 0$$

$$P \cos \theta = \mu(W + P \sin \theta)$$

$$P \cos \theta = \mu W + P \mu \sin \theta$$

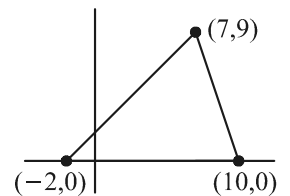
$$P(\cos \theta - \mu \sin \theta) = \mu W, \quad P = \frac{\mu W}{\cos \theta - \mu \sin \theta}$$



$$10. \bar{x} = \frac{-2 + 10 + 7}{3} = \frac{15}{3} = 5$$

$$\bar{y} = \frac{0 + 0 + 9}{3} = \frac{9}{3} = 3$$

$$\bar{x} = 5, \quad \bar{y} = 3$$



11. 應變無因次單位

12. 水下 3000 m

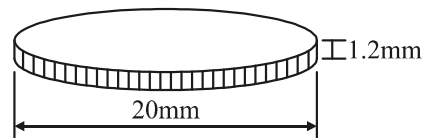
$$\sigma = \frac{3000}{10} \times 0.1 = 30 \text{ MPa}$$

$$\epsilon_v = -\frac{3\sigma}{E}(1 - 2\mu) = -\frac{3 \times 30}{600 \times 10^3}(1 - 2 \times 0.3) = 6 \times 10^{-5}$$

$$\epsilon_v = \frac{\Delta V}{V}$$

$$\Delta V = \epsilon_v \times V = 6 \times 10^{-5} \times 10^3 = 6 \times 10^{-2} = 0.06 \text{ cm}^3$$

13.



$$A = \pi D t = \pi \times 20 \times 1.2 = 24\pi \text{ mm}^2$$

$$P = A \tau = 24\pi \times 360 = 8640\pi \text{ N}$$

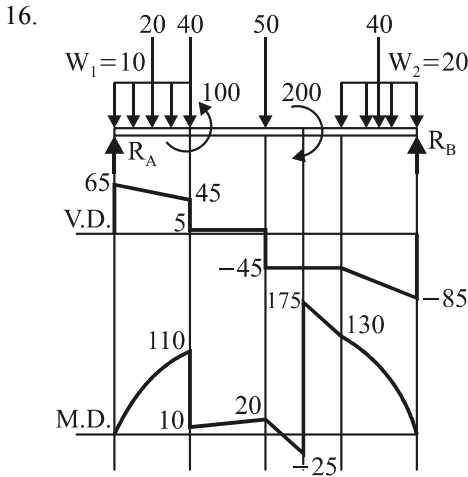
$$14. \sigma = \frac{1}{2}(\sigma_x + \sigma_y) + \frac{1}{2}(\sigma_x - \sigma_y) \cos 2\phi$$

$$\therefore \sigma_x = \sigma_y = 80$$

$$\therefore \sigma = \frac{1}{2}(80 + 80) = 80, \quad \text{與 } \phi \text{ 無關}$$

$$\tau = -\frac{1}{2}(\sigma_x - \sigma_y) \sin 2\phi = 0, \quad \text{與 } \phi \text{ 無關}$$

15. (A) 梁無荷重段，剪力圖為水平線



$$\Sigma M_A = 0$$

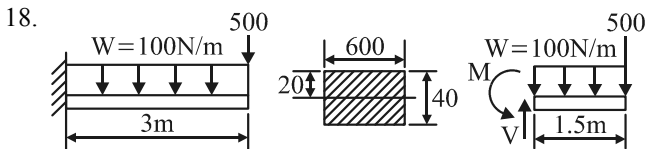
$$8R_B - 20 \times 1 - 40 \times 2 - 50 \times 4 - 40 \times 7 + 100 - 200 = 0$$

$$R_B = 85 \text{ N}(\uparrow)$$

$$\Sigma F_y = 0, R_A + 85 - 40 - 20 - 50 - 40 = 0$$

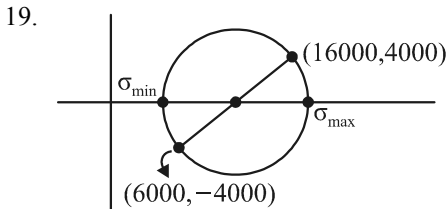
$$R_A = 65 \text{ N}(\uparrow)$$

17. (A) 中立面必在梁內部



$$M = 150 \times 0.75 + 500 \times 1.5 = 862.5 \text{ N-m}$$

$$\sigma = \frac{My}{I} = \frac{862.5 \times 10^3 \times 20}{\frac{600 \times 40^3}{12}} = 5.39 \text{ N/mm}^2 \text{ (MPa)}$$



$$\text{圓心 } x = \frac{16000 + 6000}{2} = 11000$$

$$\text{半徑 } r = \sqrt{(16000 - 11000)^2 + (4000)^2} \doteq 6403$$

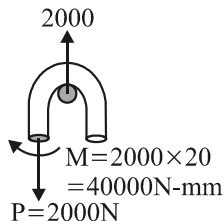
$$\sigma_{\max} = 11000 + 6403 = 17403 \text{ MPa}$$

20. 內側 $\sigma = \sigma_1 + \sigma_2$

$$\sigma_1 = \frac{P}{A} = \frac{2000}{\frac{\pi \times 10^2}{4}} = \frac{80}{\pi}$$

$$\sigma_2 = \frac{My}{I} = \frac{40000 \times 5}{\frac{\pi \times 10^4}{64}} = \frac{1280}{\pi}$$

$$\sigma = \sigma_1 + \sigma_2 = \frac{80}{\pi} + \frac{1280}{\pi} = \frac{1360}{\pi} \text{ MPa}$$



22. 水泥化學成分之主要四種化合物為：矽酸二鈣 C_2S ，矽酸三鈣 C_3S ，鋁酸三鈣 C_3A ，鋁鐵酸四鈣 C_4AF
23. 布蘭氏(Biaine)氣透儀法目的是為試驗水泥之細度
24. 新鮮波特蘭水泥之比重約為 3.16~3.14
- 25.

篩號	各篩骨材殘留量		殘留於篩上骨材累積之百分比(%)
	公克(g)	百分比(%)	
#4	0	0	0
#8	350	17.5	17.5
#16	340	17	34.5
#30	250	12.5	47
#50	460	23	70
#100	300	15	85
#200	100	5	90
底盤	200	10	100
總計	2000	100	F.M =

$$F.M = \frac{0 + 17.5 + 34.5 + 47 + 70 + 85}{100} = \frac{254}{100} = 2.54$$

#200 非標準篩，故不列入計算

26. 高性能混凝土(High Performance Concrete)簡稱 HPC
27. 混凝土若添加輸氣劑，可增加抗凍融之能力，增加水密性減少浮水，增進混凝土工作度等
28. 工作度係表示混凝土澆置與搗實之難易程度及抵抗材料分離程度
29. 花崗岩(火成岩)，玄武岩(火成岩)，砂、頁岩(水成岩)，石英岩(變質岩)
30. 依 96 年修訂 CNS382 修訂之普通磚之尺寸為 200 mm x 95 mm x 53 mm
31. 玻璃主要的化學成份為矽酸(SiO_2)
32. 針入度試驗目的是檢驗瀝青材料之軟硬程度
33. 判斷瀝青與柏油之差異，加熱後產生之氣體分別為「瀝青加熱則產生青白色氣體，柏油加熱後產生綠黃色氣體」
34. 針葉樹：松、柏、檜、杉、銀杏
闊葉樹：櫟、樟、柚、楓、柳安
35. 角材 1 才 = 1 台寸 x 1 台寸 x 1 丈
= 1 台寸 x 1 台寸 x 10 台尺 = 100 台寸³
板材 1 才 = 1 台尺 x 1 台尺 x 1 台寸
= 10 台寸 x 10 台寸 x 1 台寸 = 100 台寸³
(1) 板材：5(6 x 3 x 1) = 90 才
(2) 角材：3(3 x 3 x 1) = 27 才
(3) 闊葉原木(長度在 5 m 以內)：
2(4 x 0.5 x 0.5) = 2 m³，2 x 360 = 720 才
總計：90 + 27 + 720 = 837 才
36. 坊間常見「PU」用來作為操場跑道或屋頂防水，所謂「PU」是指聚氨基甲酸酯樹脂
37. 纖維中含碳量在 90% 以上者稱為碳纖維
38. 鋼經過「淬火」會增大其硬度、強度而韌性變差
39. 依 CNS8499 不銹鋼規定之相關用途：
200 系列(工業用)
300 系列(餐具、食品容器)
400 系列(醫療器具)
40. 多油性假漆其「樹脂」與「乾性油」之比例為 100 : 150 以上

第二部分：工程材料

21. 國際標準化機構(ISO)為：International Organization for Standardization