112 學年度科技校院四年制與專科學校二年制

統一入學測驗公告答案

考科代碼：4-01-1

類　　別：機械群

考　　科：專業科目(一)機件原理、機械力學

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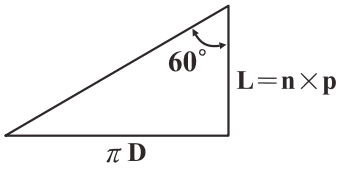
1	B	11	D	21	C	31	C	41		51	
2	C	12	C	22	C	32	D	42		52	
3	D	13	B	23	B	33	C	43		53	
4	A	14	A	24	C	34	B	44		54	
5	C	15	C	25	B	35	A	45		55	
6	A	16	C	26	A	36	B	46		56	
7	C	17	A	27	D	37	D	47		57	
8	D	18	B	28	D	38	D	48		58	
9	D	19	D	29	B	39	C	49		59	
10	A	20	B	30	B	40	A	50		60	

1. (B)由圖判別為右螺旋，故螺帽亦為右螺旋。用右手四個手指併攏反時針轉，拇指向右表示螺帽向右移動。螺帽旋轉 1 圈即移動距離為導程(L)

$(L)=\pi D\times\cot 60^\circ=\pi\times 20\times\frac{1}{\sqrt{3}}=\frac{20\pi}{\sqrt{3}}$ mm



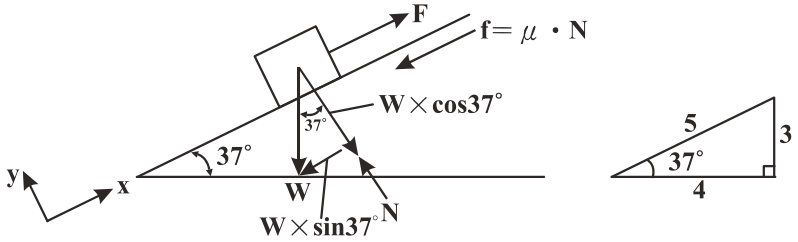
2. (C)(1)$\because \Sigma F_Y=0$

$\Rightarrow N=W\times\cos 37^\circ=\frac{4}{5}W$

(2)$\because \Sigma F_X=0$

$\Rightarrow F=W\times\sin 37^\circ+\mu\times N=(\frac{3}{5}+0.25\times\frac{4}{5})W=\frac{4}{5}W$

(3)$\because \eta=\frac{E_o}{E_i}=\frac{W\times 3}{F\times 5}=\frac{W\times 3}{(\frac{4}{5}W)\times 5}=0.75=75\%$



3. (D)槽縫螺帽屬於利用摩擦阻力鎖緊的摩擦鎖緊裝置。

4. (A)(1)$\because \tau_S=\frac{2T}{D\times W\times L}=\frac{2\times(100\times 10^6)}{1000\times 12\times 100}=167(MPa)$

(2)$\because \sigma_C=\frac{4T}{D\times H\times L}=\frac{4\times(100\times 10^6)}{1000\times 8\times 100}=500(MPa)$

5. (C)碳鋅電池盒壓緊裝置與手電筒內極座彈簧，採用錐形彈簧。
6. (A)滾動軸承共通性之功能包括：①適合高速運轉；②潤滑容易；④啟動阻力小。
7. (C)V 型皮帶(又稱三角皮帶)，傳動時可承受衝擊負載，皮帶斷面為梯形狀，皮帶兩側面夾角為 40°，槽輪凹槽角度約為 34°～38°傳動時底部不應與槽輪接觸。
8. (D)$\because \dfrac{N_A}{N_B}=\dfrac{R_B}{R_A}=\dfrac{3}{2}=3:2$
9. (D)①向左、②向右。(找，①主動齒輪判別為右螺旋，用右手且四指併攏向上，則拇指向左表示軸向推力方向向左，另②從動齒輪軸向推力方向向右。
10. (A)(1)$\because C=\dfrac{M(T_A+T_B)}{2} \Rightarrow 180=\dfrac{4(30+T_B)}{2} \Rightarrow T_B=60$(齒)

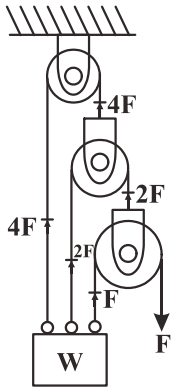
    (2)$\because \dfrac{N_A}{N_B}=\dfrac{T_B}{T_A} \Rightarrow \dfrac{60}{N_B}=\dfrac{60}{30}=2 \Rightarrow N_B=30$(rpm)
11. (D)(1)$\because e_{A/B}=\dfrac{N_B-N_m}{N_A-N_m}=\dfrac{-T_A}{T_B}$

    $\therefore e_{A/B}=\dfrac{(13)-(3)}{(-2)-(3)}=-2$

    (2)$\because e_{A/B}=-2=\dfrac{-T_A}{T_B}=\dfrac{-20}{T_B} \Rightarrow T_B=10$(齒)

    (3)$\because C=\dfrac{M(T_A+T_B)}{2}=\dfrac{3\times(20+10)}{2}=45$mm

    (4)$\because D_{PB}=M\times T_B=3\times 10=30$mm
12. (C)周轉輪系主動輪轉速增加，若從動輪及旋臂轉速不變，則輪系值會減少。
13. (B)汽機車常見規格用詞，稱「前碟後鼓」指的是制動器(剎車)。
14. (A)凸輪總升距固定，凸輪之基圓半徑增大時，因為壓力角減小，側向壓力會減輕。
15. (C)此四連桿機構為雙曲柄(牽桿)機構，其條件之一為 AD－AB＜BC＋CD。雙曲柄(牽桿)機構無死(靜)點。
16. (C)$\because W=7F\times(1-20\%) \Rightarrow F=\dfrac{2800}{7\times 0.8}=500$(N)



17. (A)多爪棘輪可使棘輪運動角度縮小，減少無效擺動，常應用於套筒板手。

18. (B)自行車零組件後輪轂內有棘輪，使得向後踩不會倒退。

19. (D)整台自行車稱為機械。

20. (B)(1)$\because D_{前}=\frac{P\times T_{前}}{\pi}=\frac{1.3\times 38}{\pi}=\frac{49.4}{\pi}$(mm)

$\because D_{後}=\frac{P\times T_{後}}{\pi}=\frac{1.3\times 19}{\pi}=\frac{24.7}{\pi}$(mm)

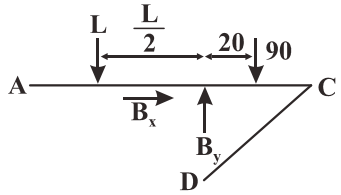
(2)$\because L=\frac{\pi}{2}(\frac{49.4}{\pi}+\frac{24.7}{\pi})+2\times 44+\frac{(\frac{49.4}{\pi}-\frac{24.7}{\pi})^2}{4\times 44}=127.4$(mm)

22. $M=F\times d=60\times 5=300N-m$

23. $R=\sqrt{300^2+400^2}=500$

24. $M=F\times d=10\times 0.4=4(N-m)$

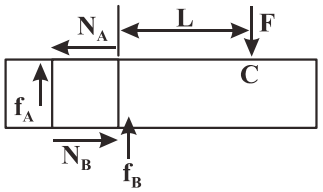
25.



$\Sigma M_B=0 \quad \Rightarrow 90\times 20=L\times\frac{L}{2}$

$\Rightarrow L^2=3600 \quad \Rightarrow L=60$(mm)

26.



＊3 個未知數 N_A、N_B、μ

(1)$\Sigma F_x=0 \quad \Rightarrow N_A=N_B$；

(2)$\Sigma M_C=0 \quad \Rightarrow f_A\times(L+b)+f_B\times L-N_B\times a=0$

$\Rightarrow \mu N_A\times(L+b)+\mu N_B\times L-N_B\times a=0$

$\Rightarrow \mu[L+b+L]=a \quad \Rightarrow \mu=\frac{a}{2L+b}$

27. $S=V_1t+\frac{1}{2}at^2$

$\Rightarrow \frac{L}{2}=60\times t=\frac{1}{2}\times 3600\times t^2 \quad \Rightarrow t=\frac{1}{30}$(hr)

$\Rightarrow \frac{L}{2}=60\times\frac{1}{30} \quad \Rightarrow L=4$(km)

28. $\theta = \omega_1 t + \frac{1}{2}\alpha t^2$

$\Rightarrow 40\times 2\pi = 0 + \frac{1}{2}\times\alpha\times 1^2 \quad \Rightarrow \alpha = 160\pi\ (\mathrm{rad/s^2})$

29. $T = 25\mathrm{kg}$

$W_B = (T+2T)\times 2 = 6T = 150\mathrm{kg}$

30. $\frac{1}{2}kx^2 = mgh$

$\Rightarrow \frac{1}{2}\times k\times(100)^2 = 10\times(10000+150)$

$\Rightarrow k = 20.3\mathrm{N/mm} = 203\mathrm{N/cm}$

31. $\delta = \frac{100\times 200}{EA} - \frac{(F-100)\times 100}{EA} = 0 \quad \Rightarrow F = 300(\mathrm{N})$

32. $\varepsilon_V = \frac{\triangle V}{V} = \varepsilon_x + \varepsilon_y + \varepsilon_z = \frac{1-2\mu}{E}(\sigma_x + \sigma_y + \sigma_z)$

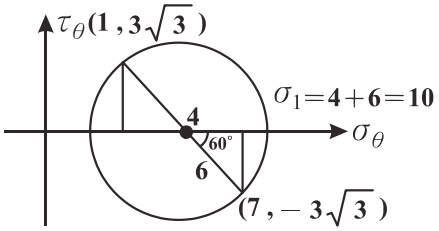
$\Rightarrow 10 + 30 + \sigma_z = 0 \quad \Rightarrow \sigma_z = -40(\mathrm{MPa})$

33. (1)$T = F\times r = 400\times 250 = 100000(\mathrm{N-mm})$；

(2)鍵 $F = \tau\times A = 10\times(10\times 50) = 5000\mathrm{N}$

(3)$T = F\times\frac{d}{2} \quad \Rightarrow 100000 = 5000\times\frac{d}{2} \quad \Rightarrow d = 40(\mathrm{mm})$

34.



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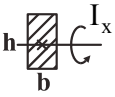
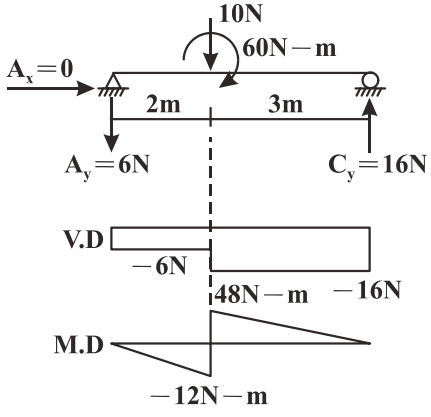


$\overline{I_x} = \frac{bh^3}{12} \quad \Rightarrow k_x = \sqrt{\frac{\overline{I_x}}{A}} = \frac{h}{\sqrt{12}}$

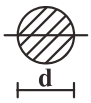
36.



37. (1) $A = bh = \frac{\pi d^2}{4} \quad \Rightarrow b = \frac{\pi d^2}{4h}$

(2) 

$$\Rightarrow z_1 = \frac{\bar{I}}{y} = \frac{\frac{bh^3}{12}}{\frac{h}{2}} = \frac{bh^2}{6} = \frac{\pi d^2 h}{24}$$



$$\Rightarrow z_2 = \frac{\bar{I}}{y} = \frac{\frac{\pi d^4}{64}}{\frac{d}{2}} = \frac{\pi d^3}{32}$$

(3) $z_1 = z_2 \quad \Rightarrow \frac{\pi d^2 h}{24} = \frac{\pi d^3}{32} \quad \Rightarrow d = \frac{32h}{24} = \frac{32 \times 120}{24} = 160$

38. 矩形 $\Rightarrow \tau_{max} = \frac{3V}{2A}$

圓形 $\Rightarrow \tau_{max} = \frac{4V}{3A}$

$$\Rightarrow \frac{\frac{3V}{2A}}{\frac{4V}{3A}} = \frac{9}{8}$$

39. (1) $\tau = \frac{Tr}{J} \quad \Rightarrow \tau_{max} = \frac{16T}{\pi d^3} \quad \Rightarrow T = \frac{\tau_{max} \times \pi d^3}{16}$

(2) $\underline{P} = T \times \omega = \frac{\tau_{max} \times \pi d^3}{16} \times \omega$

$$\Rightarrow 0.8\pi^2 \times 1000 \times 1000 = (\frac{160 \times \pi \times d^3}{16}) \times (\frac{300}{60} \times 2\pi)$$

$$\Rightarrow d^3 = 8000 \quad \Rightarrow d = 20(mm)$$

40. $\phi = \frac{TL}{GJ} \quad \Rightarrow L = \frac{\phi GJ}{T} = \frac{9 \times \pi}{180} \times \frac{64000 \times \frac{\pi}{32} \times 10^4}{10000} = 100\pi^2(mm) = 10\pi^2(cm)$