科目：動力學　　類組別：D5　共 4 頁第 1 頁　　*請在試卷答案卷（卡）內作答

(題 1 至 13 爲單選題，答錯倒扣題分 1/4 !!)

The slotted arm *OA* oscillates about *O* and drives the crank *CP* as shown in **Fig. 1**. Assume $\dot{\theta} = K = \text{constant}$.

1. (9%) The magnitude of the velocity of *P* is (A) *bK*/2 (B) *bK* (C) 2*bK* (D) 4*bK*.

2. (8%) The magnitude of the acceleration of *P* is (A) $4bK^2$ (B) 4*bK* (C) 2*bK* (D) $2b^2K$.

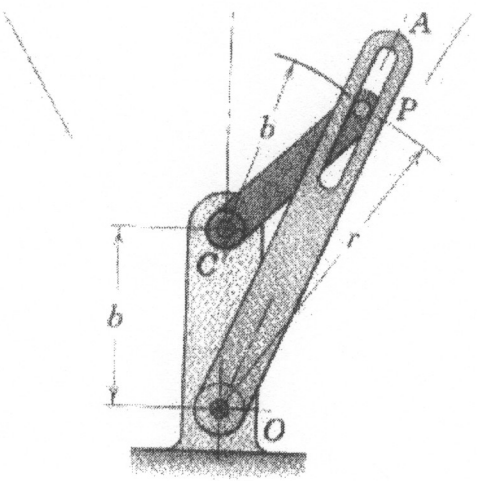

Fig. 1

3. (8%) As shown in **Fig. 2**, under the action of force *P*, the constant acceleration of block B is 2 m/s^2 up the incline. For the instant when the velocity of *B* is 1.2 m/s up, the acceleration of *B* relative to *A* is (A) 0.8 m/s (B) 2 m/s (C) 0.4 m/s (D) 1 m/s.

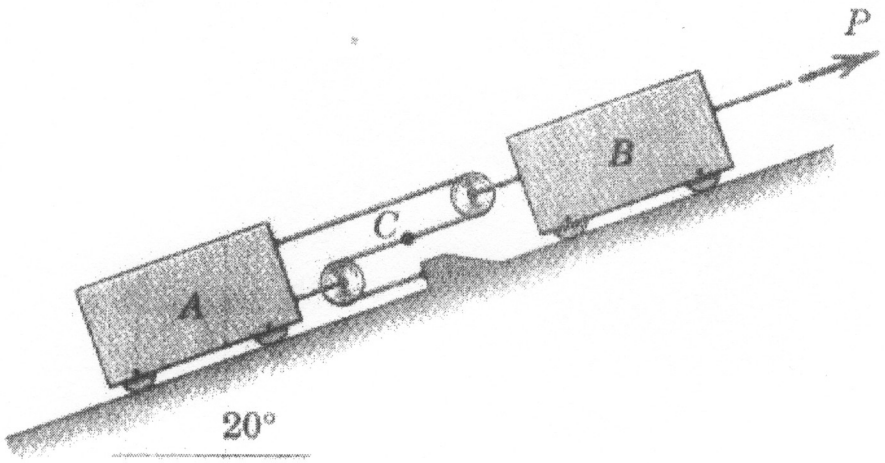

Fig. 2

4. (4%) When the velocity of a particle is constant, its acceleration is (A) constant; (B) zero; (C) time varying; (D) none of the above.

5. (4%) For free-flight motion of a projectile, when air resistance is neglected, the only force acting on the projectile is (A) its weight; (B) the vertical component of initial throwing force; (C) the horizontal component of initial throwing force; (D) all of the above.

6. (7%) A ball is thrown from a position 5 ft above the ground to the roof of a 40-ft-high building, as shown in **Fig. 3**. If the initial velocity of the ball is 70 ft/s, inclined at an angle of 60° from the horizontal, which of *R'* (the range from the point where the ball is thrown to where it strikes the roof) and *h* (the maximum height the ball can reach) is larger?
(A) $R'>h$; (B) $R'=h$; (C) $R'<h$; (D) It may be $R'>h$ or $R'<h$ dependent on different conditions.

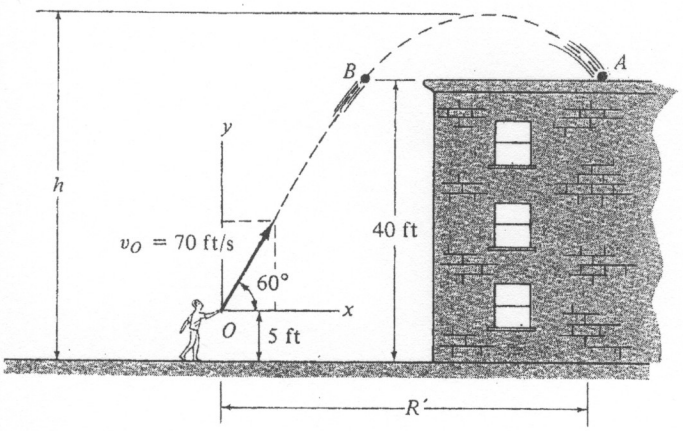

Fig. 3

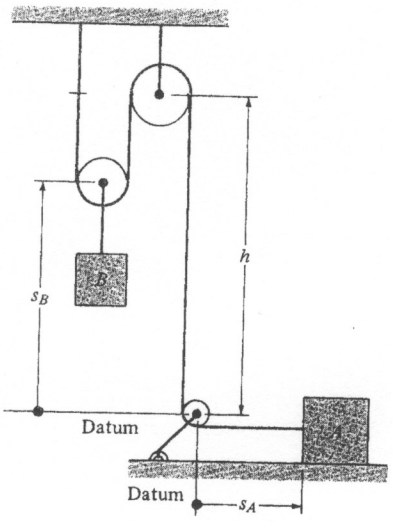

Fig. 4

A dependent motion of two blocks is shown in **Fig. 4**. In this case, the position of block *A* is specified by s_A, and the position of block *B* from the center of the bottom pulley (a fixed point) is defined as s_B.

7. (5%) Which one of the following equations can be set based upon the above description?

(A) $3h-2s_B+s_A=l$; (B) $h+2s_B+s_A=l$; (C) $h+3s_B+s_A=l$; (D) $3h-3s_B+s_A=l$.

8. (5%) Which relationship between the acceleration of block A and B, i.e. a_A and a_B, is correct?

(A) $2a_B=a_A$; (B) $2a_B+a_A=0$; (C) $3a_B+a_A=0$; (D) $3a_B=a_A$.

9. (5%) **Fig. 5** 中，*B* 以等速度 18 in/sec 向右移動，*A* 的速度應爲多少？

(A) 9　(B) 18　(C) 27　(D) 36　in/sec。

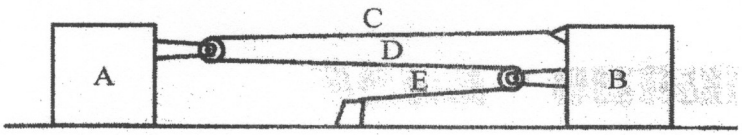

Fig. 5

10. (5%) 一汽車速率爲 108 km/h，剎車滑行 75 m 後靜止，該汽車停止所費時間爲 (A) 5　(B) 6　(C) 7　(D) 8　sec。

11. (5%) 續上題，輪胎與地面之摩擦係數爲 (A) 0.416　(B) 0.612　(C) 0.543　(D) 0.725。

12. (5%) **Fig. 6** 中一鐵絲 *ACB* 穿過 *C* 球，*C* 球質量 5 kg 以定速率在圖示水平圓上轉動，已知鐵絲之張力皆相同，則其速率爲 (A) 3.47　(B) 4.47　(C) 5.46　(D) 6.46　m/sec。

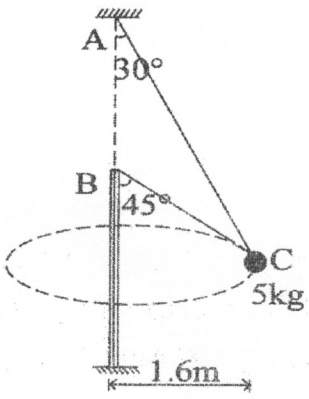

Fig. 6

13. (5%) 續上題，若其速率爲 *V*，則鐵絲之張力爲 (A) 1.563 V^2　(B) 2.589 V^2　(C) 3.125 V^2　(D) 4.419 V^2　N。

(題 14 至 18 爲單複選混合，答錯不倒扣 !!)

14. (5%) 當重力加速度 g 值改變時，下列何者會改變? (A) 物體之重量；(B) 物體之重力位能; (C) 物體之重心; (D) 物體之質心。

15. (5%) 在質點-彈簧系統中，系統之總機械能 E ($E=T+V_e+V_g$)的變化量ΔE，等於下列何者? (A) 所有外力對系統所作之功; (B) 所有保守力對系統所作之功; (C) 所有非保守力對系統所作之功; (D) 以上皆非。

16. (5%) 三個質量相同且半徑相同的圓柱、圓球及圓環自等高之斜面滾下來，則何者會先滾至地面? (A) 圓柱; (B) 圓球: (C) 圓環; (D) 同時。

17. (5%) 質點在完全彈性的碰撞下，下列何者不變? (A) 質點系統之動量; (B) 質點系統之角動量; (C) 質點系統之角衝量; (D) 質點系統之動能。

18. (5%) 在固定座標及等速運動座標(relative coordinate)觀察一質點之運動，則下列何者不正確? (A) $dU=dU_{rel}$; (B) $\sum \overline{M_B} = \overline{(\dot{H}_B)_{rel}}$; (C) $T=T_{rel}$; (D) $\sum \overline{F} = \overline{\dot{G}_{rel}}$; (E) $\overline{G} = \overline{G_{rel}}$ (式中 U 爲功，M_B 爲力矩，H_B 爲角動量，T 爲動能，G 爲線衝量)。