編號： 115

國立成功大學 108 學年度碩士班招生考試試題

系　　所：工程科學系

考試科目：工程力學

考試日期：0224，節次：1

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

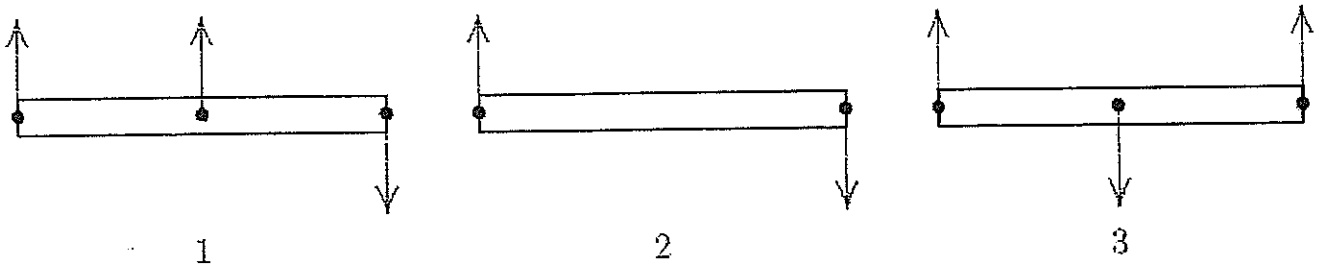
靜力學部分

注意: 靜力學共有五題，批改人員將核對每題的最後答案，計算或誘導過程不必詳列。請考生將每題的答案 (若有單位請包含單位) 以方框標註出來，以利批改考卷。

1. (3%) If the magnitude of the sum of two vectors is less than the magnitude of either vector, then:
   A. The scalar product of two vectors must be negative
   B. The scalar product of two vectors must be positive
   C. The vectors must be parallel and in opposite directions
   D. The vectors must be parallel and in the same direction
   E. None of the above

2. (3%) The two vectors $(3m)\hat{i}-(2m)\hat{j}$ and $(2m)\hat{i}+(3m)\hat{j}-(2m)\hat{k}$ define a plane. It is the plane of the triangle with both tails at one vertex and each head at one of the other vertices. Determine a vector which is perpendicular to the plane.

3. (4%) Three identical uniform rods are each acted on by two or more forces, all perpendicular to the rods and all equal in magnitude, Which of the rods could be in static equilibrium if an additional force is applied at the center of mass of the rod?
   A. Only 1
   B. Only 2
   C. Only 3
   D. Only 1 and 2
   E. Only 1 and 3
   F. Only 2 and 3
   G. All three



1　　2　　3

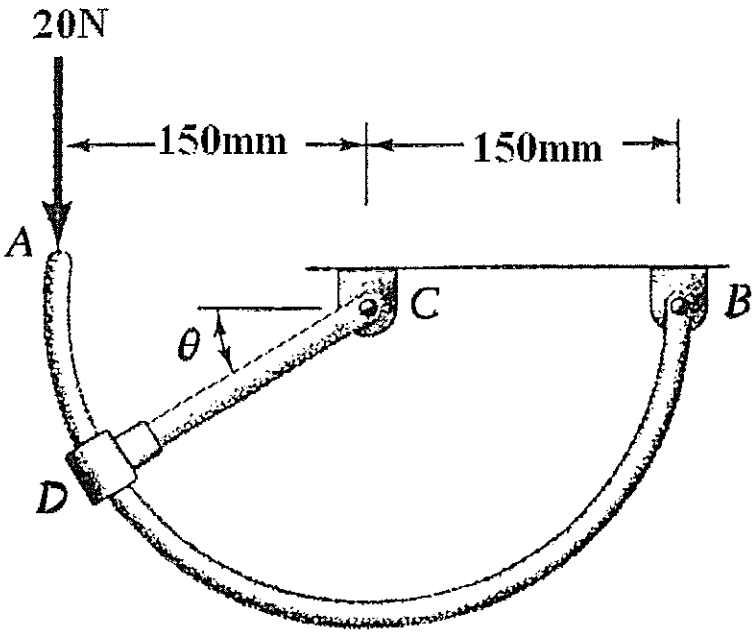
國立成功大學 108 學年度碩士班招生考試試題

系　　所：工程科學系

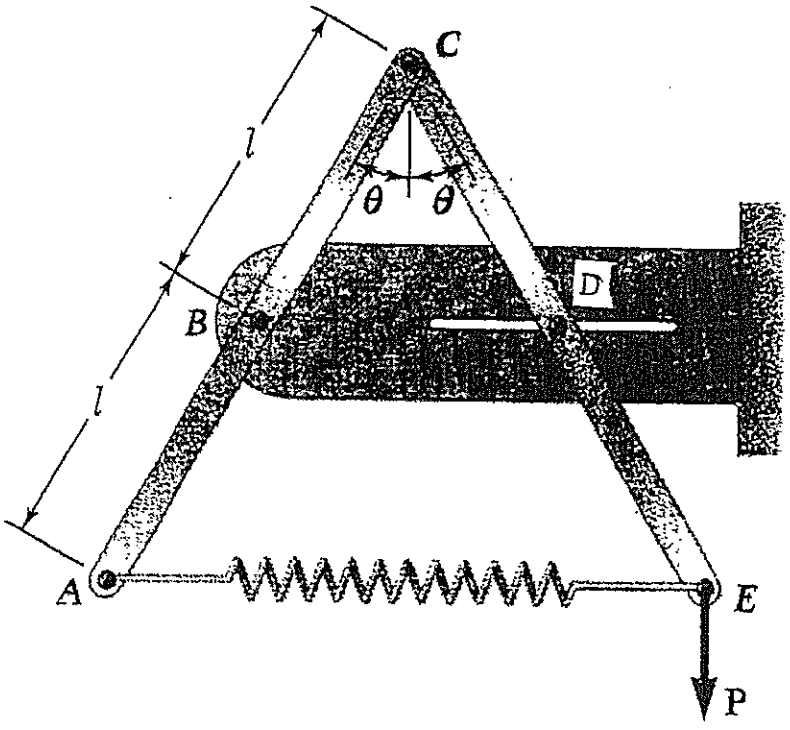
考試科目：工程力學

考試日期：0224，節次：1

4. (20%) Rod *CD* is fitted with a collar at *D* that can be moved along rod *AB*, which is bent in the shape of an arc of circle. For the position when $\theta = 30°$, determine (a) the force in rod *CD*, (b) the reaction at *B*.



5. (20%) Two rods *AC* and *CE* are connected by a pin at *C* and by a spring *AE*. The constant of the spring is *k*, and the spring is unstretched when $\theta = 30°$. For the loading shown, derive an equation in *P*, θ, *l*, and *k* that must be satisfied when the system is in equilibrium.



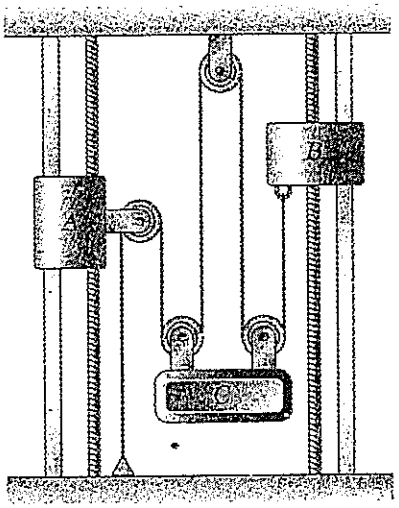
※ 考生請注意：本試題可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

注意： 第6至10題為動力學部分，每題都是單選題，答錯不倒扣。批改人員只核對每題的答案選項（A-J）而不核對計算過程。請將每題最接近你的計算結果的答案選項（A-J）寫在你的答案紙並標明題號。若你只寫數值答案，而沒有寫答案選項（A-J），則該題以零分計。譬如第6題若你的計算結果最接近 30，則應該寫A而非 30。

---

6. (10%) At a certain time, collar *A* moves downward with a constant velocity of 140 mm/s, and collar *B* moves upward with a constant velocity of 40 mm/s. What is the velocity of the block *C* at the time?

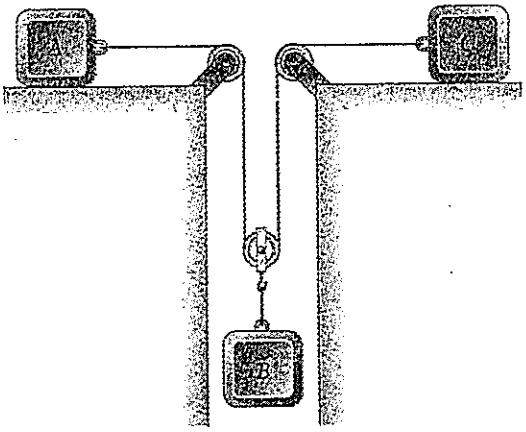
(A) 30 mm/s upward (B) 40 mm/s upward
(C) 50 mm/s upward (D) 60 mm/s upward
(E) 70 mm/s upward (F) 30 mm/s downward
(G) 40 mm/s downward (H) 50 mm/s downward
(I) 60 mm/s downward (J) 70 mm/s downward



---

7. (10%) Each of the three blocks has a mass of 10 kg. The coefficients of friction between the blocks and the horizontal surfaces are $\mu_s = 0.24$ and $\mu_s = 0.20$. What is the tension in the cord?

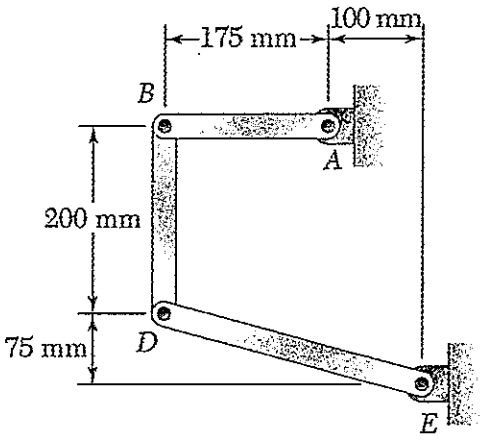
(A) 39 N (B) 41 N (C) 43 N (D) 45 N (E) 47 N
(F) 49 N (G) 51 N (H) 53 N (I) 55 N (J) 57 N



※ 考生請注意：本試題可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

8. (10%) In the position shown, bar *AB* has an angular velocity of 4 rad/s clockwise. What is the magnitude of the angular velocity of bar *DE*?

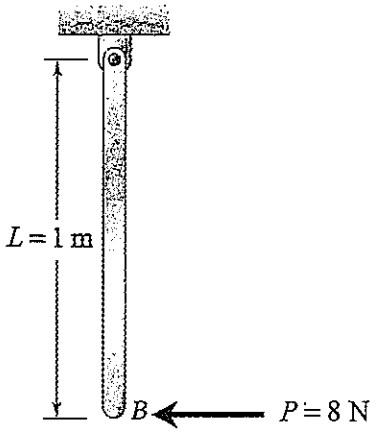
(A) 1.95 rad/s (B) 2.10 rad/s (C) 2.25 rad/s
(D) 2.40 rad/s (E) 2.55 rad/s (F) 2.70 rad/s
(G) 2.85 rad/s (H) 3.00 rad/s (I) 3.15 rad/s
(J) 3.30 rad/s



---

9. (10%) A uniform slender rod of length $L = 1$ m and mass $m = 2$ kg hangs freely from a hinge at *A*. A force of magnitude $P = 8$ N is applied at *B* horizontally as shown. What is the magnitude of the angular acceleration of the rod?

(A) 6 rad/s^2 (B) 7 rad/s^2 (C) 8 rad/s^2
(D) 9 rad/s^2 (E) 10 rad/s^2 s (F) 11 rad/s^2
(G) 12 rad/s^2 (H) 13 rad/s^2 (I) 14 rad/s^2
(J) 15 rad/s^2



---

10. (10%) A sphere of radius r and mass m is placed on a horizontal floor with no linear velocity but with a clockwise angular velocity ω. Let μ_k be the coefficient of kinetic friction between the sphere and the floor and g be the gravitational acceleration. What is the time t at which the sphere will start rolling without sliding. (Note: For the sphere, $\bar{I} = 2mr^2/5$.)

(A) $\frac{r\omega}{7\mu_k g}$ (B) $\frac{2r\omega}{7\mu_k g}$ (C) $\frac{3r\omega}{7\mu_k g}$ (D) $\frac{4r\omega}{7\mu_k g}$
(E) $\frac{5r\omega}{7\mu_k g}$ (F) $\frac{6r\omega}{7\mu_k g}$ (G) $\frac{r\omega}{\mu_k g}$ (H) $\frac{8r\omega}{7\mu_k g}$
(I) $\frac{9r\omega}{7\mu_k g}$ (J) $\frac{10r\omega}{7\mu_k g}$