編號： 118

國立成功大學 106 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

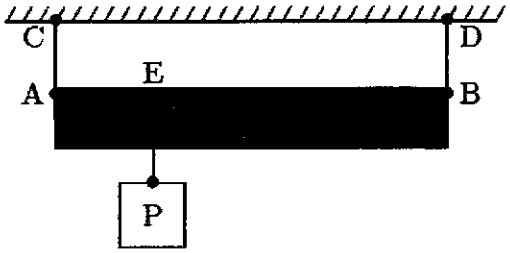
考試日期：0214，節次：1

※ 考生請注意：本試題不可使用計算機。　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

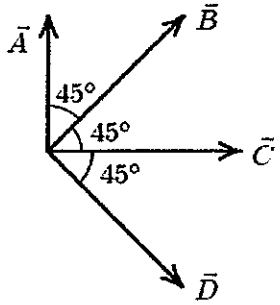
注意: 靜力學共有五題，第一到第三題，每題只有一個答案，第四、第五題為計算題。批改人員將只核對每題的最後答案，計算或誘導過程不必列出。請考生將每題的答案 (若有單位請包含單位) 以方框標註出來，以利批改考卷。

1. (3%) A uniform rod AB is 1.2m long and weight 16N. It is suspended by strings AC and BD as shown. A block P weighing 96N is attached at E, 0.3m from A. Determine the magnitude of the tension force of the string BD.



2. (3%) A certain wire stretches 0.9cm when outward forces with magnitude F are applied to each end. The same forces are applied to a wire of the same material but with three times the diameter and three times the length. Determine the elongation of the second wire.

3. (4%) Four vectors ($\vec{A}, \vec{B}, \vec{C}, \vec{D}$) all have the same magnitude. The angle θ between adjacent vectors is 45° as shown. Determine which vector equation is correct:



A. $\vec{A}-\vec{B}-\vec{C}+\vec{D}=0$

B. $\vec{B}+\vec{D}-\sqrt{2}\vec{C}=0$

C. $\vec{A}+\vec{B}=\vec{B}+\vec{D}$

D. $\vec{A}+\vec{B}+\vec{C}+\vec{D}=0$

E. $(\vec{A}+\vec{C})/\sqrt{2}=-\vec{B}$.

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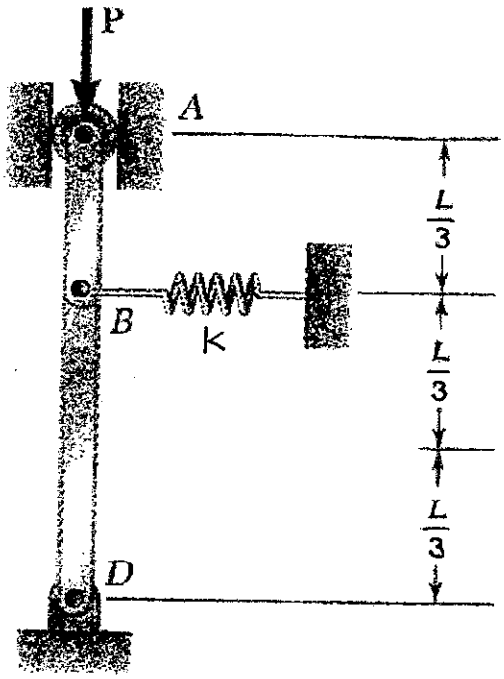
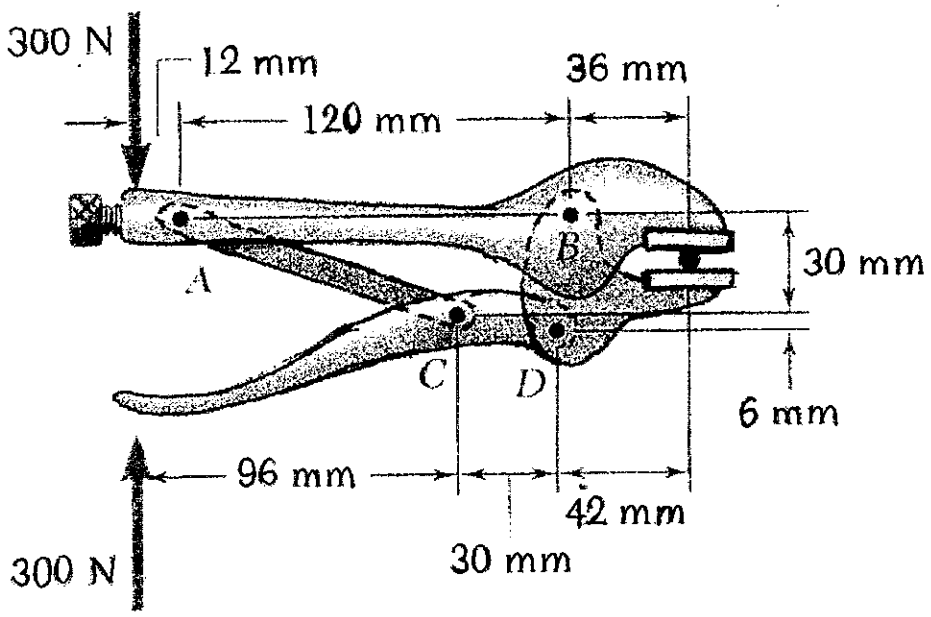
4. (20%) Two bars are attached to a single spring of constant k that is upstretched when the bars are vertical. Determine the range of values of P for which the equilibrium of the system is stable in the position shown.



5. (20%) Determine the magnitude of the gripping forces produced when two 300N forces are applied as shown.



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注意： 第6至12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（A-E）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-E）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-E），則該題以零分計。譬如第6題若你的計算結果最接近 70 m/s，則應該寫A而非70 m/s。

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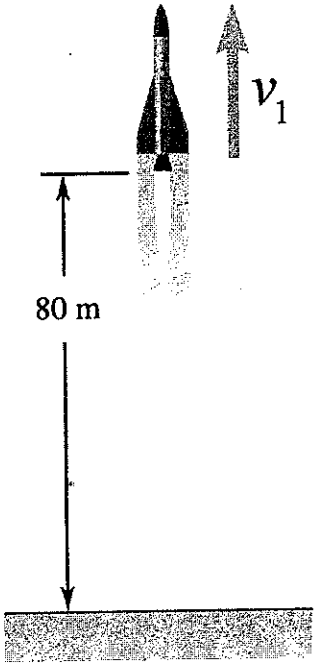
6. (7%) A group of students launches a model rocket in the vertical direction. Based on tracking data, they determine that the altitude of the rocket was 80 m at the end of the powered portion of the flight and that the rocket landed 16 seconds later. Assume that the descent parachute failed to deploy so that the rocket fell freely to the ground after reaching its maximum altitude and assume that the gravitational acceleration g = 10 m/s^2. What is the speed v_1 of the rocket at the end of powered flight?
(A) 70 m/s (B) 75 m/s (C) 80 m/s (D) 85 m/s (E) 90 m/s



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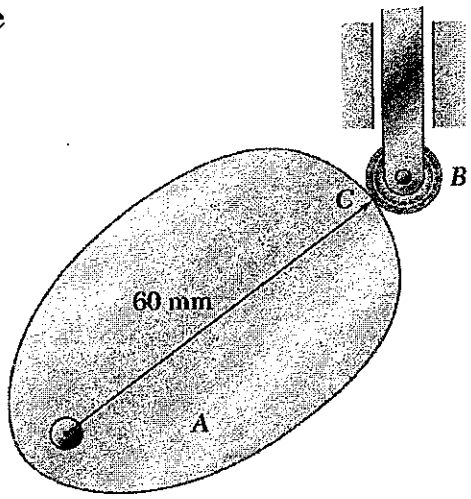
7. (7%) As cam A rotates, follower wheel B rolls without slipping on the face of the cam. The normal components of the acceleration of the points of contact at C of the cam A and the wheel B are 1.5 rn/s^2 and 9 rn/s^2, respectively. What is the diameter of the follower wheel B?
(A) 10 mm (B) 11 mm (C) 12 mm (D) 13 mm (E) 14 mm



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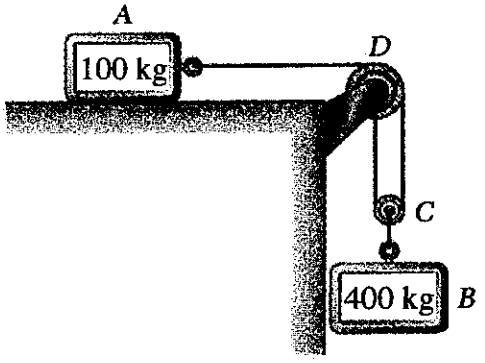
8. (7%) The two blocks shown start from rest. The horizontal plane and the pulley are frictionless, and the pulley is assumed to be of negligible mass. What is the tension in the cord *ADCD*?
(A) 600 N (B) 700 N (C) 800 N (D) 900 N (E) 1000 N



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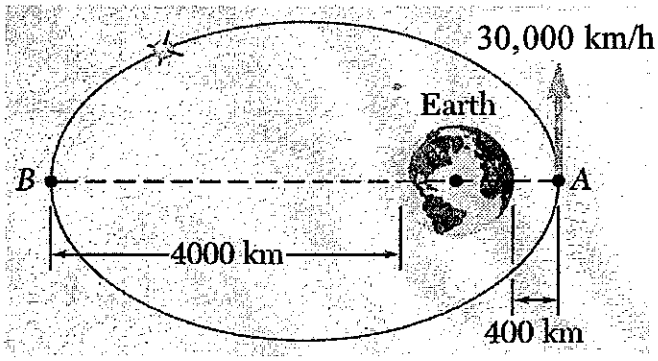
9. (7%) A satellite is launched in a direction parallel to the surface of the earth with a velocity of 30,000 km/h from an altitude of 400 km. What is the speed of the satellite as it reaches its maximum altitude of 4000 km? (The radius of the earth is 6370 km.)
(A) 5,000 km/h (B) 10,000 km/h (C) 15,000 km/h (D) 20,000 km/h (E) 25,000 km/h



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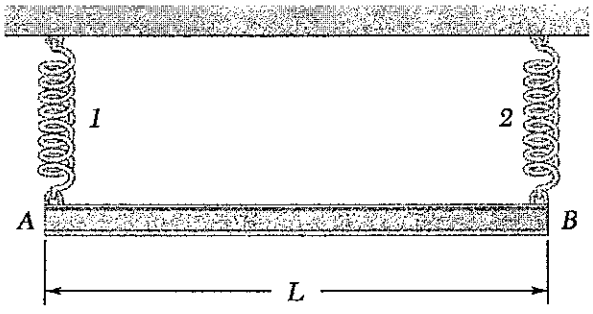
10. (7%) A beam *AB* of mass *m* and of uniform cross section is suspended from two springs as shown. If spring 2 breaks, at that instant what is the magnitude of the angular acceleration of the bar? (Use *g* for the gravitational acceleration.)
(A) $\frac{2g}{L}$ (B) $\frac{3g}{L}$ (C) $\frac{4g}{L}$ (D) $\frac{6g}{L}$ (E) $\frac{12g}{L}$



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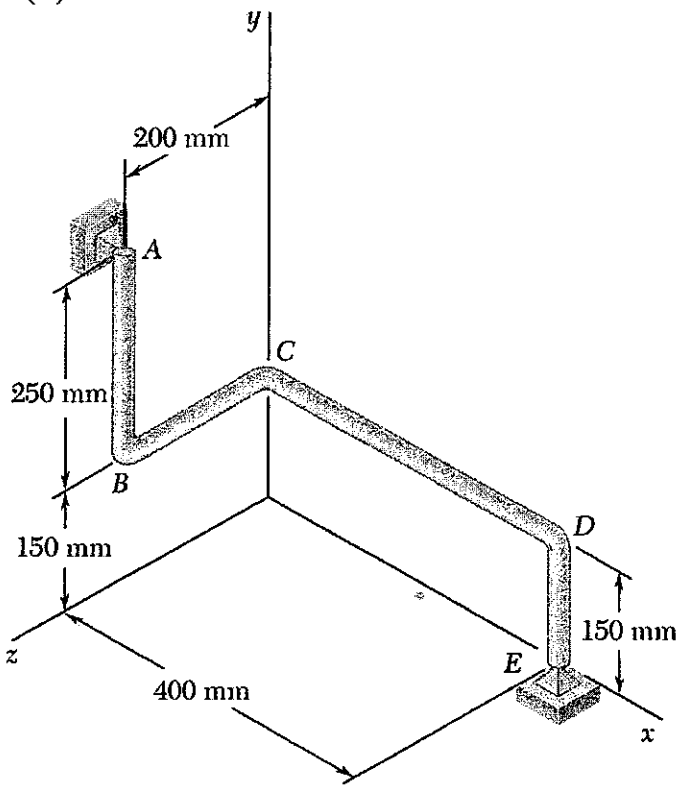
11. (7%) The bent rod *ABCDE* rotates about a line joining *A* and *E* with a constant angular velocity of 9 rad/s. What is the speed of *C*?

(A) 1.0 m/s (B) 1.5 m/s (C) 2.0 m/s (D) 2.5 m/s (E) 3.0 m/s



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12. (8%) A uniform sphere of mass *m* and radius *r* is projected along a rough horizontal surface with a constant speed $\overline{v}_1$ as shown. If μ_k is the coefficient of kinetic friction between the sphere and the surface, what is the time at which the sphere will start rolling without sliding? (The mass moment of inertia of the sphere is $2mr^2/5$.)

(A) $\frac{2\overline{v}_1}{7\mu_k g}$ (B) $\frac{3\overline{v}_1}{7\mu_k g}$ (C) $\frac{4\overline{v}_1}{7\mu_k g}$ (D) $\frac{5\overline{v}_1}{7\mu_k g}$ (E) $\frac{6\overline{v}_1}{7\mu_k g}$