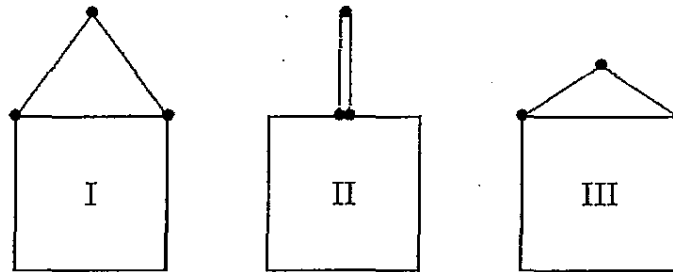※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

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. (5%) A picture can be hung on a wall with string in three different ways, as shown. In which one, the largest magnitude of the tension force of the string will be generated?


2. (5%) Two supports are 2 m apart. A stiff board with a length of 4 m and a mass of 10 kg is placed on the supports, with one support at the left end and the other at the midpoint. A block is placed on the board a distance of 0.5m from the left end. As a result the board is horizontal. Determine the mass of the block.

3. (10%) Determine the required tension in cable AC, knowing that the resultant of the three forces exerted at point C of boom BC must be directed along BC.
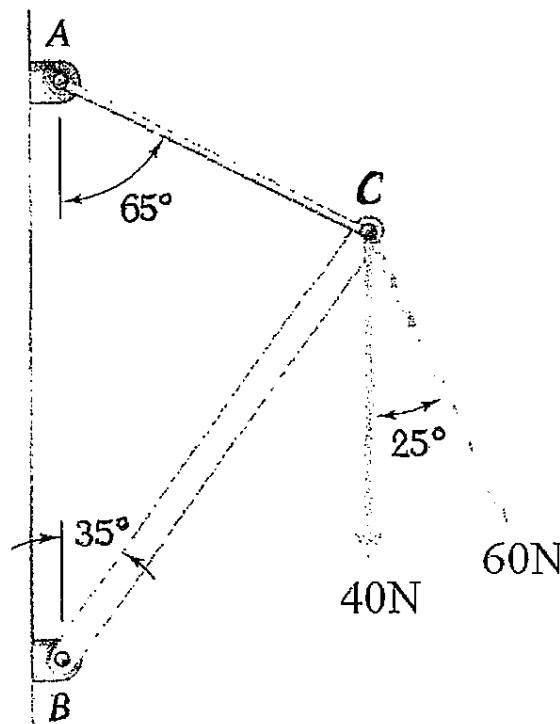
4. (15%) A collar B of weight W may move freely along the vertical rod shown. The constant of the spring is k, and the spring is unstretched when $\theta = 0$. If the collar is in equilibrium, determine the equation which θ must be satisfied. Knowing that $W = 200N$, $l = 400mm$, and $k = 800N/m$.
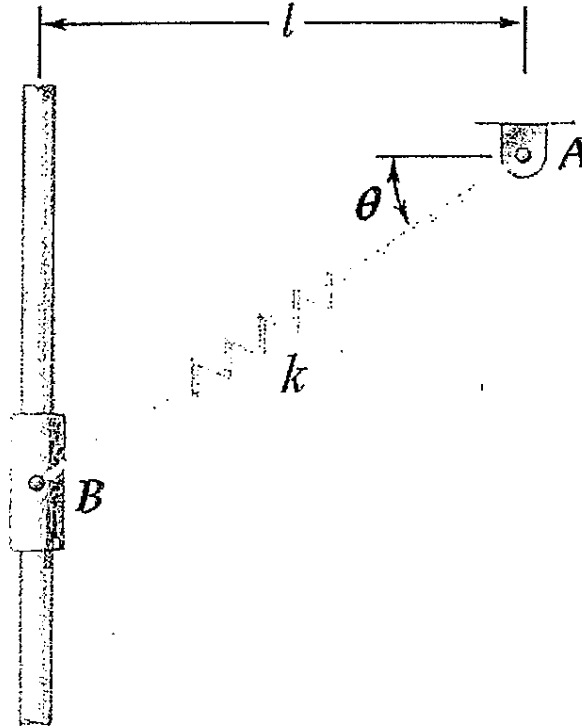
5. (15%) The position of boom ABC is controlled by the hydraulic cylinder BD. For the loading shown, determine the force exerted by the hydraulic cylinder on pin B when $\theta = 65°$.
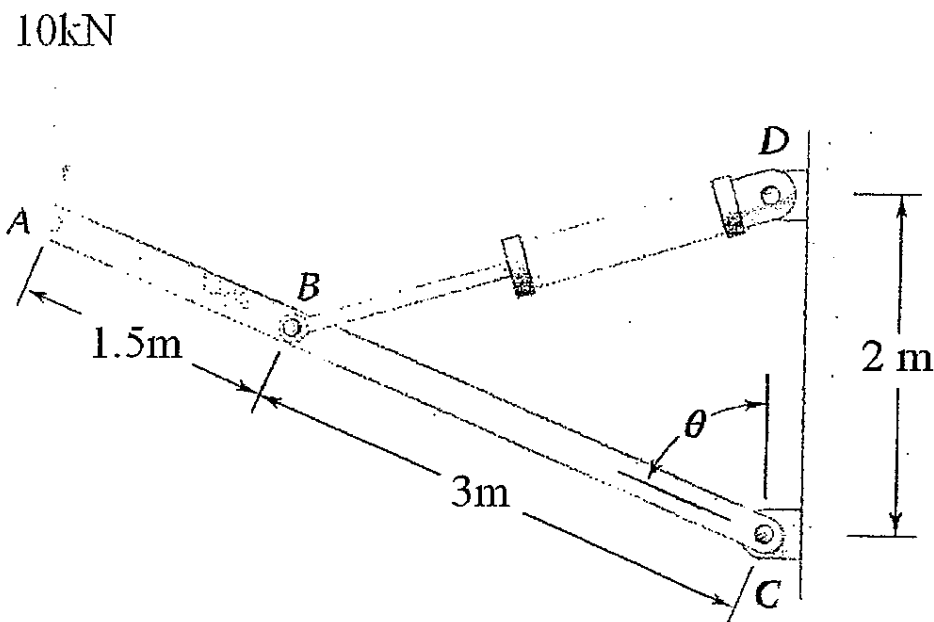
※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

注意： 第6至11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 0.01，則應該寫A而非 0.01。

---

6. (8%) The acceleration of a particle is defined by the relation $a = -kv^2$, where the acceleration a is expressed in m/s² and the velocity v in m/s. The particle starts at $x = 0$ m with a velocity of 9 m/s, and when $x = 13$ m the velocity is found to be 7 m/s. Which one in the following is the closest value of the constant k?

(A) 0.01 (B) 0.02 (C) 0.03 (D) 0.04 (E) 0.05 (F) 0.06 (G) 0.07 (H) 0.08 (I) 0.09 (J) 0.10

---

7. (8%) The 10-kg block B is supported by the 40-kg block A which is pulled up an incline by a 500-N force. The friction between block A and the incline is neglegible. Knowing that block B does not slip on block A, what is the magnitude of the static friction between the blocks?

(A) 40 N (B) 41 N (C) 42 N (D) 43 N (E) 44 N (F) 45 N (G) 46 N (H) 47 N (I) 48 N (J) 49 N

---
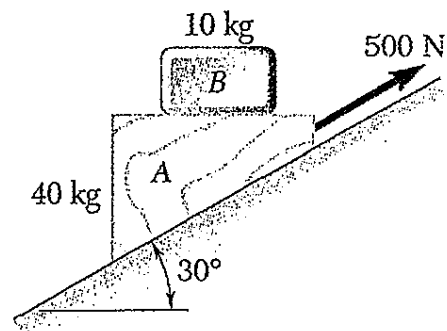
8. (8%) An 8-kg plunger is released from rest in the position shown and is stopped by two nested springs. The constant of the outer spring is 3,000 N/m, and the constant of the inner spring is 10,000 N/m. If the maximum deflection of the outer spring is observed to be 150 mm, what is the height h from which the plunger was released?
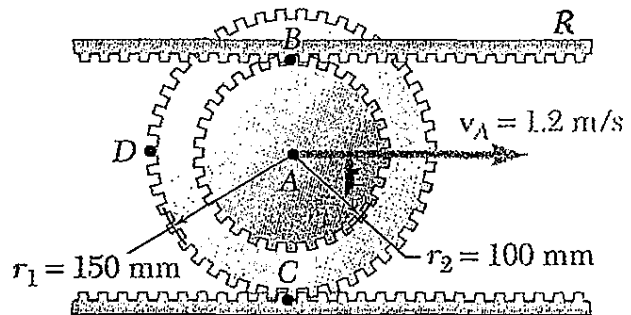
(A) 200 mm (B) 300 mm (C) 400 mm (D) 500 mm
(E) 600 mm (F) 700 mm (G) 800 mm (H) 900 mm
(I) 1000 mm (J) 1100 mm
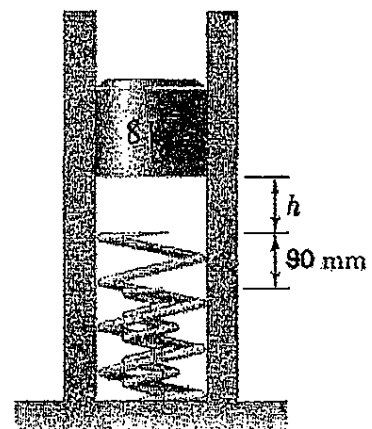
※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

9. (8%) The double gear shown rolls on the stationary lower rack; the velocity of its center A is 1.2 m/s directed to the right. What is the magnitude of the velocity of the upper rack R?

(A) 1.2 m/s (B) 1.4 m/s (C) 1.6 m/s

(D) 1.8 m/s (E) 2.0 m/s (F) 2.2 m/s

(G) 2.4 m/s (H) 2.6 m/s (I) 2.8 m/s

(J) 3.0 m/s

10. (9%) Two disks A and B, of mass $m_A = 2$ kg and $m_B = 4$ kg, are connected by a belt as shown. Assuming no slipping between the belt and the disks, what is the magnitude of the angular acceleration of disk B if a 2.7 N·m couple $\mathbf{M}$ is applied to disk A?

(A) 9 rad/s² (B) 10 rad/s² (C) 11 rad/s²

(D) 12 rad/s² (E) 13 rad/s² (F) 14 rad/s²

(G) 15 rad/s² (H) 16 rad/s² (I) 17 rad/s²

(J) 18 rad/s²
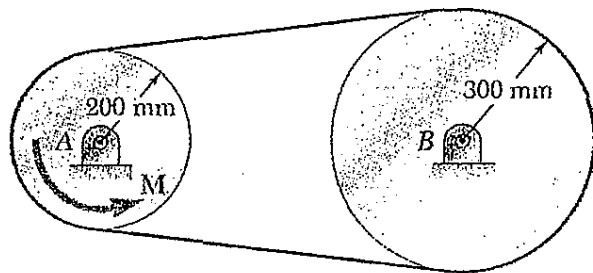
11. (9%) A 3-kg slendar rod rotates in a vertical plane about a pivot at B. A spring of constant $k = 300$ N/m and of unstretched length 120 mm is attached to the rod as shown. Knowing that in the position shown the rod has an angular velocity of 4 rad/s clockwise, what is the magnitude of the angular velocity of the rod when it rotates through 90°?

(A) 6.1 rad/s (B) 6.2 rad/s (C) 6.3 rad/s

(D) 6.4 rad/s (E) 6.5 rad/s (F) 6.6 rad/s

(G) 6.7 rad/s (H) 6.8 rad/s (I) 6.9 rad/s

(J) 7.0 rad/s