國立中山大學 114 學年度
碩士班考試入學招生考試試題

科目名稱：應用力學(含靜力學及動力學)【機電系碩士班乙組】

單選題 Multiple-Choice Questions (100%)
10 questions in total, 10 points for each question. 共 10 題，每題 10 分。
An additional deduction of 2.5 points will be applied to each incorrect answer, until the total point reaches 0. 答錯每小題倒扣 2.5 分，至多扣至總分 0 分。

1. The object shown in the figure contains three sub blocks: A, B, and C. A, B, and C use different materials, and their densities are 8 g/cm^3, 4 g/cm^3, 2 g/cm^3, respectively. Where is the coordinate position (in mm) of its mass center?
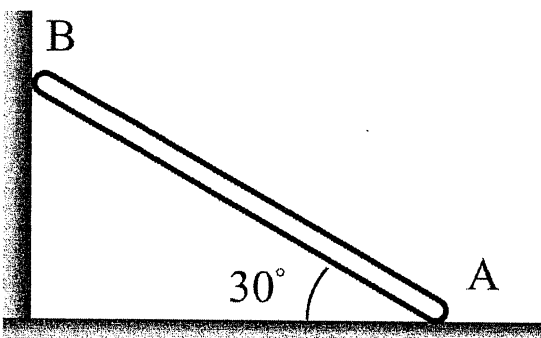   A. (19.91, 29.90, 5.10)
   B. (18.33, 28.25, 6.75)
   C. (16.76, 26.47, 8.53)
   D. (14.17, 23.33, 11.67)
   E. (18.66, 28.54, 6.46)
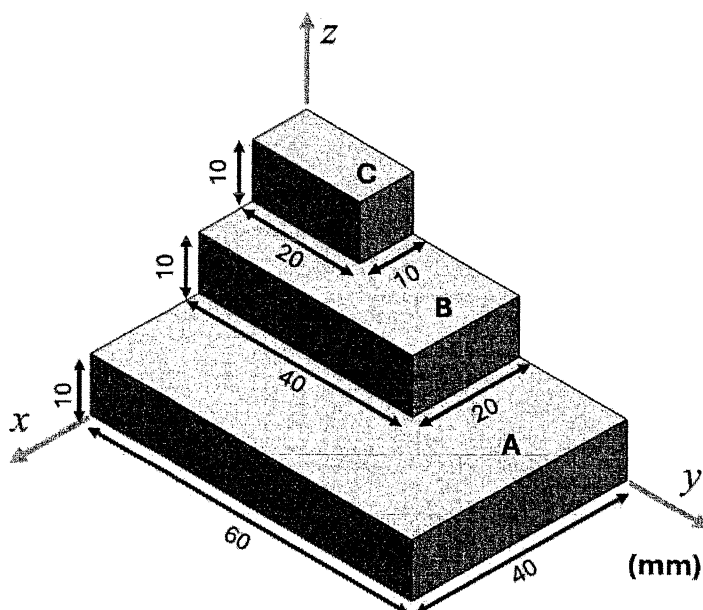
Q1:

Question 2~4
As shown in the figure, a uniform rod AB with a mass of $m = 50$ kg and a length of $L = 4$ is positioned such that one end, A, rests on a **rough** horizontal surface, while the other end, B, leans against a **smooth** vertical wall. Assume the gravitational acceleration $g = 9.8$ m/s^2. If the rod does not move,

Q2-Q4:

(questions in next page)

2. What is the approximate reaction force F_B exerted by the smooth vertical wall?
    A. 424.35 N →
    B. 354.15 N →
    C. 480.65 N →
    D. 525.72 N ⤢ 30°
    E. 377.50 N ↘ 45°

3. What is the normal reaction force N_A exerted by the horizontal surface?
    A. 245.00 N ↑
    B. 424.35 N ↑
    C. 490.00 N ↑
    D. 848.70 N ↑
    E. 980.00 N ↑

4. What is the approximate minimum coefficient of static friction to meet this condition?
    A. 0.32
    B. 0.44
    C. 0.65
    D. 0.87
    E. 0.95

(questions in next page)

Question 5~6

As shown in the figure, a war ship is on the ocean. In the beginning, the ship is static, then it fires a cannonball (砲彈) horizontally at a speed of 80 m/s (measured from ground) toward the left. Assume the mass of the ship is 1000 kg, and the mass of the cannonball is 200 kg. The engine shuts down during all processes. The gravitational acceleration $g = 9.8$ m/s². If the water drag force can be considered as constant friction force, and the coefficient of friction is 0.1:
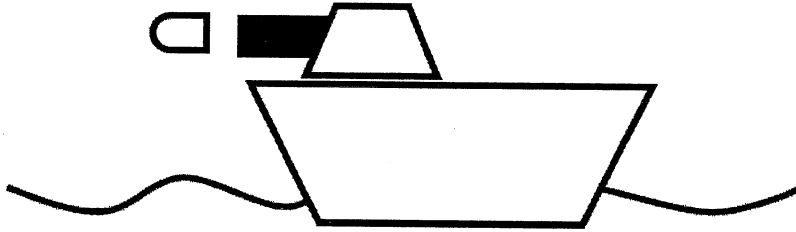
Q5-Q6:

5. What is the velocity of the ship just after firing?
    A. 23.2 m/s →
    B. 13.3 m/s →
    C. 20.0 m/s →
    D. 8.9 m/s →
    E. 16.0 m/s →

6. About how far will the ship sail before stop?
    A. 90.7 m
    B. 130.6 m
    C. 204.1 m
    D. 161.3 m
    E. 51.0 m

(questions in next page)

Question 7-9

As shown in the figure, the pendulum contains a 10-kg uniform disk and a slender rod. It is released from rest at the horizontal position. The mass of the rod can be neglected. When the pendulum swings down to the vertical position, it hits ball C that has a mass of 20 kg. At this time, the center of mass of the disk is horizontal to the center of mass of the object. During impact, ignore size effect. The gravitational acceleration $g = 9.8$ m/s². The coefficient of restitution is 0.9. Air resistance is also ignored. The moment of inertia of a disk with respect to the axis passing its center is $mR^2/2$.
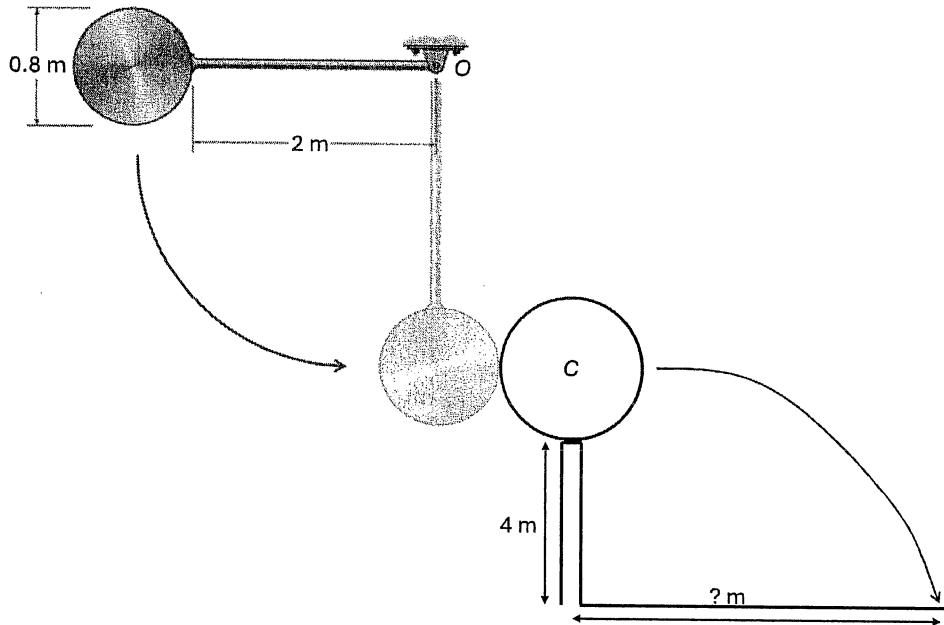
Q7-Q9:

7. Calculate the approximate time it takes for ball C to fall to the ground.
   A. 3.0 s
   B. 2.3 s
   C. 1.5 s
   D. 0.9 s
   E. 0.6 s

8. Calculate the approximate speed of ball C after impact.
   A. 2.76 m/s
   B. 3.41 m/s
   C. 4.31 m/s
   D. 5.15 m/s
   E. 8.63 m/s

(questions in next page)

試題請隨卷繳回，請留意背面是否有題

9. Calculate the approximate distance that ball C moves horizontally after the impact.
    A. 3.90 m
    B. 4.66 m
    C. 3.08 m
    D. 7.80 m
    E. 2.49 m

10. Which of the following is a non-conservative force?
    A. Earth's gravitational force
    B. Spring force
    C. Magnetic force
    D. Air resistance force
    E. Electrostatic force