

NATIONAL EXAMINATION - DECEMBER 2012

- STATICS AND DYNAMICS -

(04-BS-3)

3 HOURS' DURATION

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer-paper a clear statement of any assumption made.
2. This is a "**CLOSED BOOK**" examination. However, candidates may bring **ONE 8½"×11"** sheet of self-prepared notes. Candidates may use one of two calculators, the **Casio** or a **Sharp** approved models. The aid sheet must be submitted with the written exam paper.
3. Squared paper will be provided, on request of the candidate, as an aid in the conducting of graphical solutions, if that is the method of solution preferred.
4. Candidates are required to complete **2 questions from PART A** and **2 questions from PART B**.
5. If more than four questions are presented for assessment then only the **first four undeleted solutions encountered will be marked**.
6. All questions are of equal value.
7. **Hand in examination question paper and self-prepared note sheet (formula sheet) with solution booklet.**

PART A - STATICS
(ANSWER ANY 2 OF THE 3 QUESTIONS)

I. (20 Marks).

Determine the force in each member of the truss shown and state whether each member is in tension or compression.

NOTE: Each grid division represents a distance of one metre.

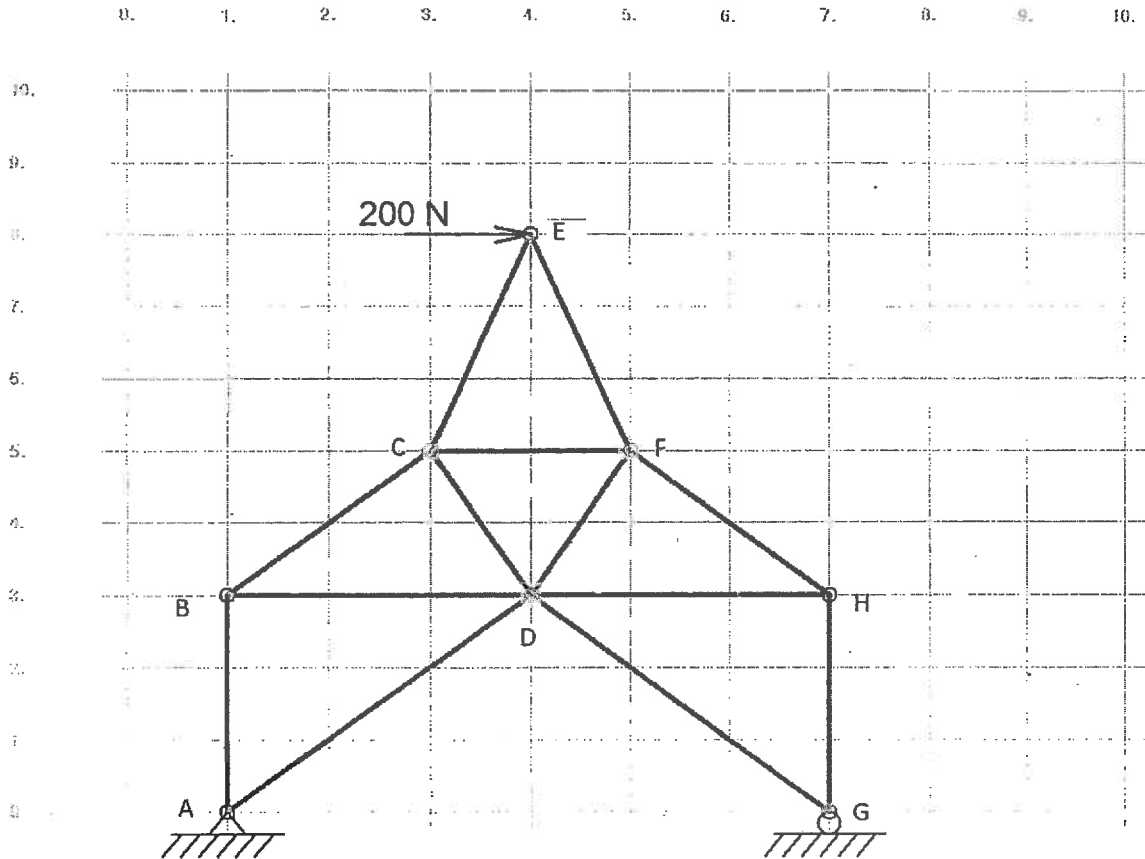


FIGURE 1.

II. (20 Marks)

The member is supported by a pin at A and a cable BC . If the load at D is 500 lb_f , determine the x , y , z components of reaction at the pin A and the tension in cable BC .

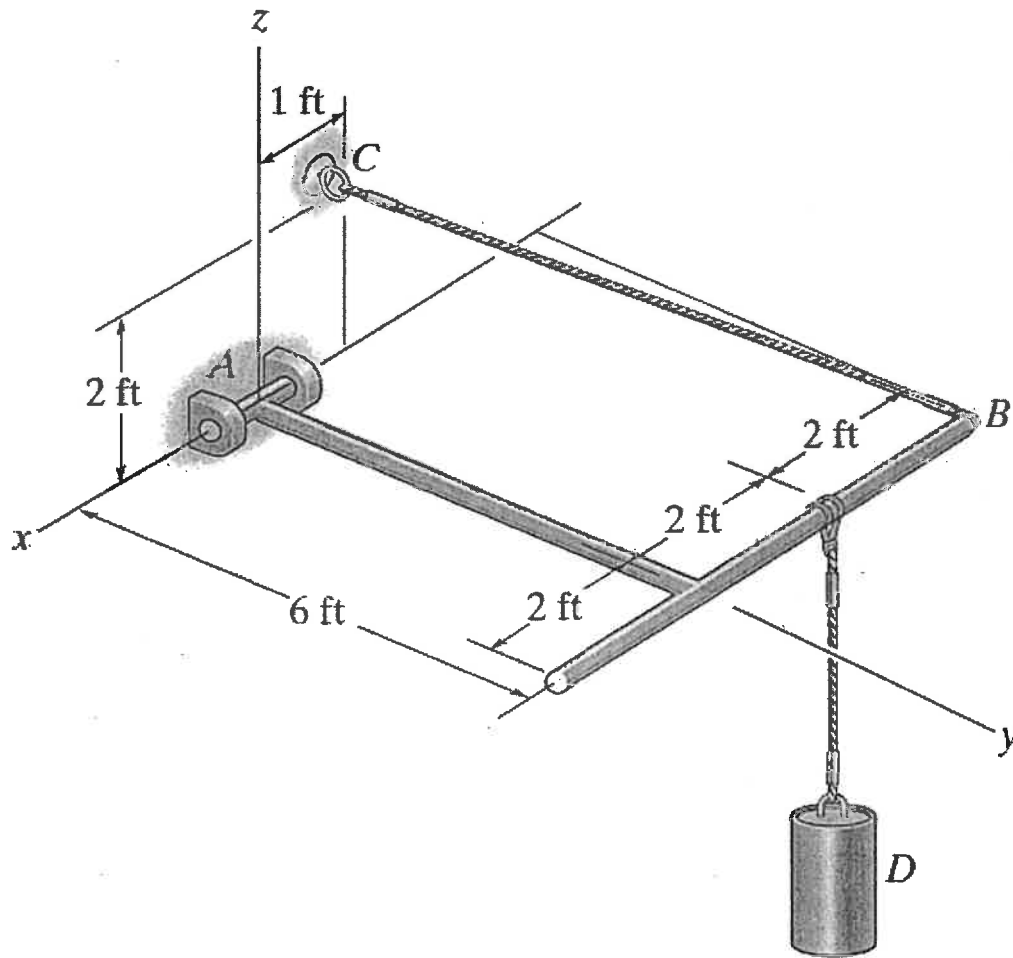


FIGURE 2

III. (20 Marks)

Blocks *A* and *B* have a mass of 8 kg and 12 kg, respectively. Using the coefficients of static friction indicated, determine the largest vertical force *P* which can be applied to the cord without causing motion.

Assume block *B* is on the verge of tipping.

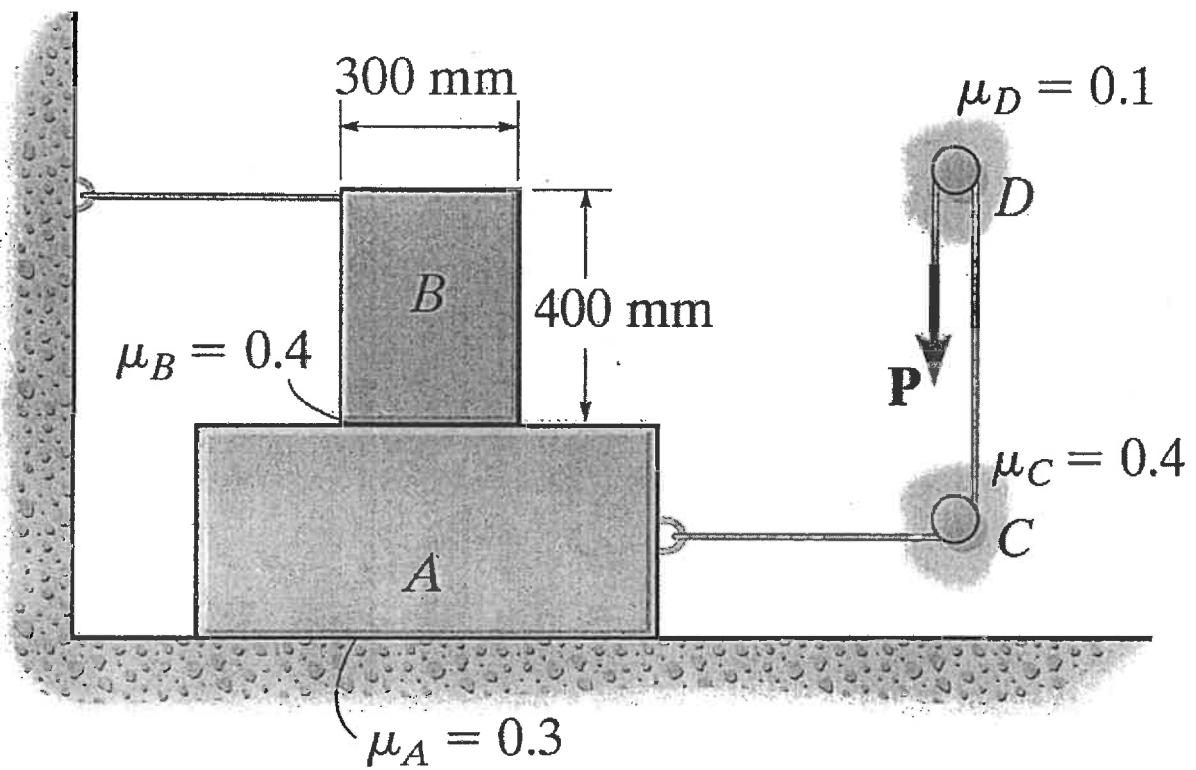


FIGURE 3

PART B - DYNAMICS
(ANSWER ANY 2 OF THE 3 QUESTIONS)

IV. (20 Marks)

If bar AB has an angular velocity $\omega_{AB} = 5 \text{ rad/sec}$, determine the velocity of the slider block C at the instant shown.

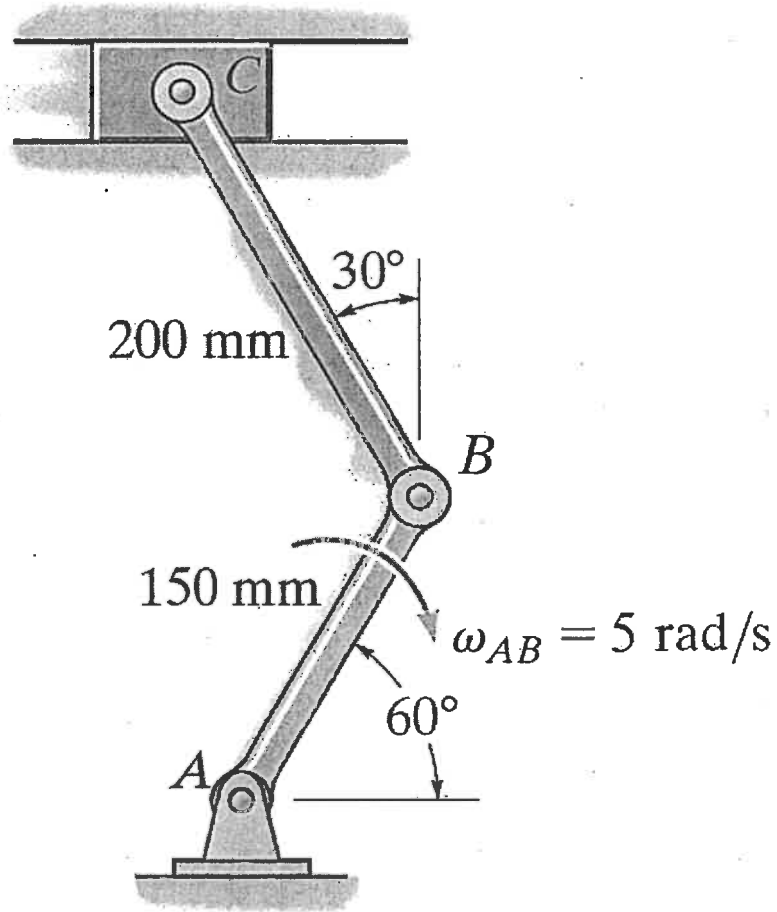


FIGURE 4.

V. (20 marks)

A person throws a ball with a horizontal velocity of $v_1 = 10 \text{ ft/sec}$ as shown in figure 5. If the coefficient of restitution between the ball and the ground is $e = 0.8$, determine

- (a) the velocity of the ball just after it rebounds from the ground and,
- (b) the maximum height "h" to which the ball rises after the first bounce.

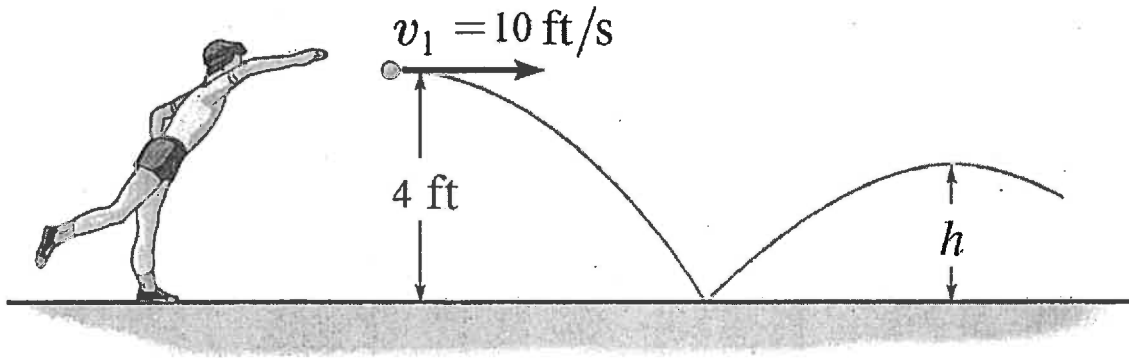


FIGURE 5.

VI. (20 marks)

The car is traveling at a speed of 40 m/sec. The driver applies the brakes at A and thereby reduces the speed at the rate of $\mathbf{a}_t = \left(-\frac{1}{8}t\right)$, where t is in seconds. Determine the acceleration of the car just before it reaches point C on the circular curve. It takes 15 sec. for the car to travel from A to C.

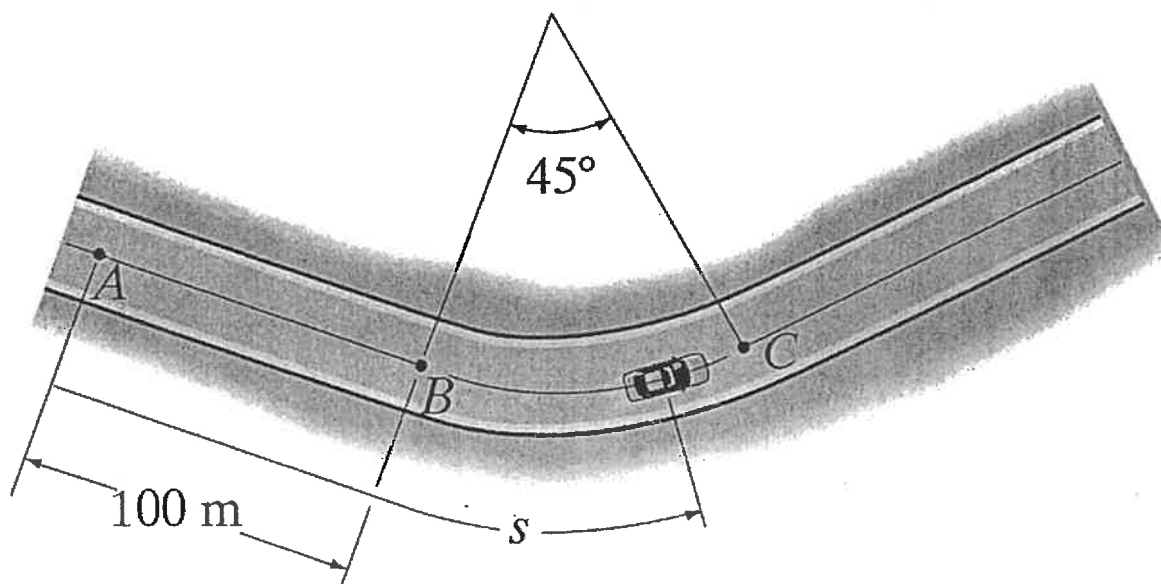


FIGURE 6.

