



## UNIVERSITY COLLEGE TATI (UC TATI)

### FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE : BET 2143

COURSE : STATIC AND DYNAMIC

SEMESTER/SESSION : 2-2024/2025

DURATION : 3 HOURS

#### Instructions:

1. This booklet contains 4 questions. Answer **ALL** questions.
2. This Final Exam is an **OPEN BOOK**.
3. All answers should be written in answer booklet.
4. Write legibly and draw sketches wherever required.
5. If in doubt, raise your hands and ask the invigilator.

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO**

**THIS BOOKLET CONTAINS 5 PRINTED PAGES INCLUDING COVER PAGE**

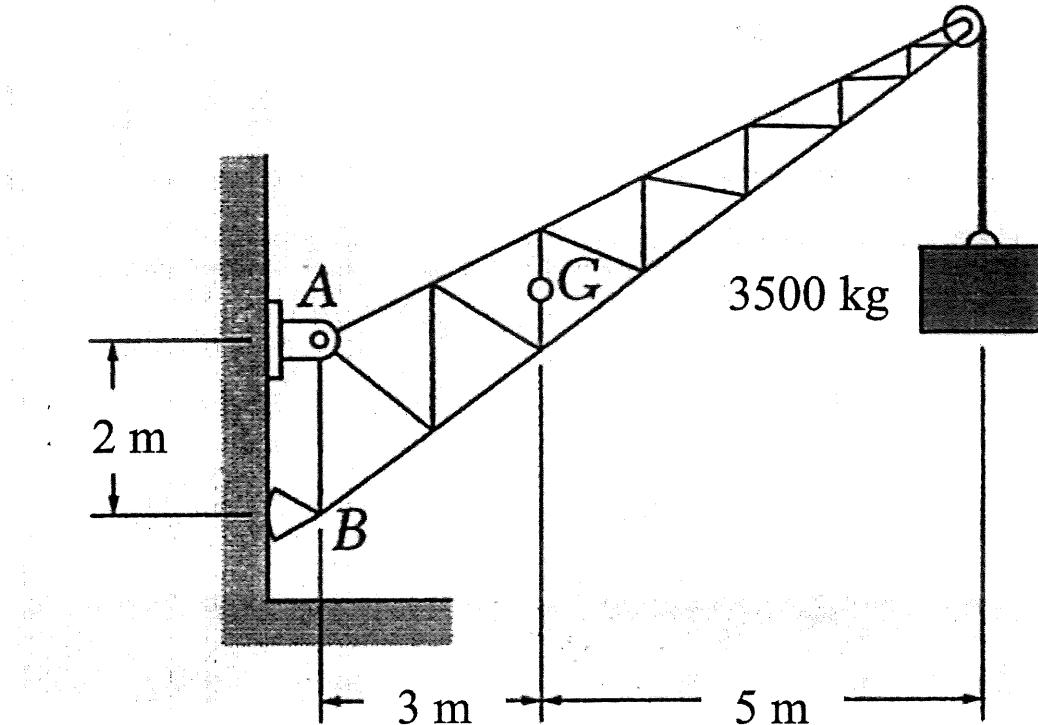
**QUESTION 1**

- a) Explain the fundamental concepts of force, mass, and weight. (3 marks)
- b) Discuss the difference between mass and weight. (3 marks)
- c) Consider two forces acting on a particle. Explain how to find the resultant force using graphical methods (e.g., parallelogram method) and vector addition. (4 marks)

**QUESTION 2**

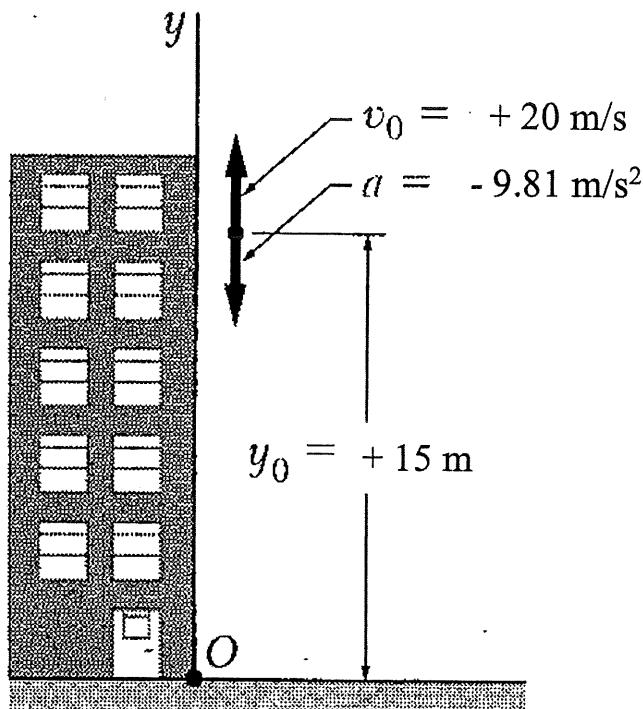
A fixed crane in Figure 1 has a mass of 2000 kg and used to lift a 3500 kg crate. It is held in place by a pin A and a rocker at B. The center of gravity of the crane is located at G. Determine the components of the reaction at A and B.

- i. Draw a free body diagram of the crane (4 marks)
- ii. Determine the components of the reaction at A and B (6 marks)

**Figure 1**

**QUESTION 3**

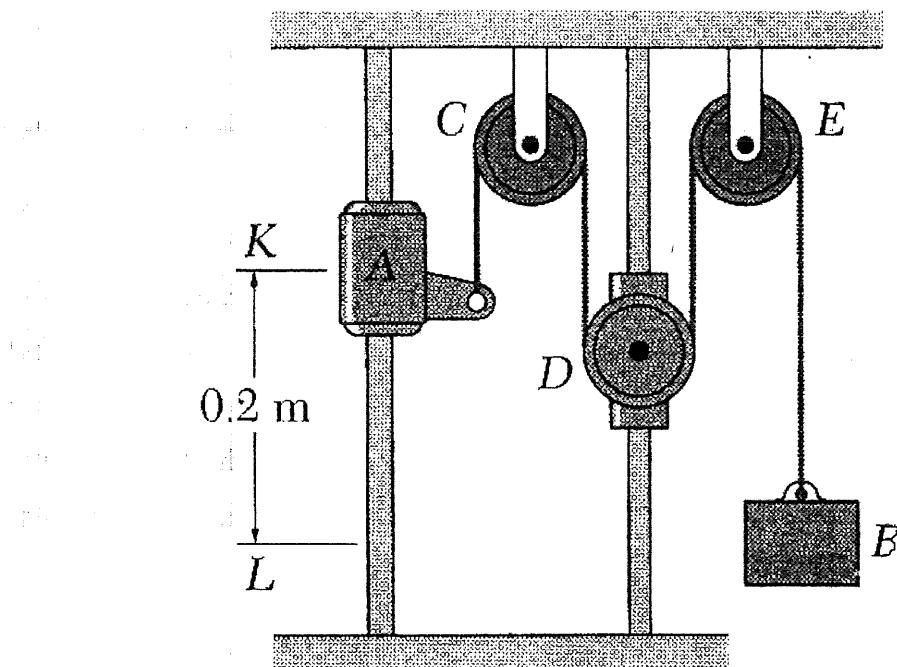
A ball in Figure 2 is tossed with a velocity of  $10\text{ m/s}$  directed vertically, upward from a window located  $20\text{ m}$  above ground. Knowing that the acceleration of the ball is constant and equal to  $9.81\text{ m/s}^2$  downward.

**Figure 2**

- i. Determine the velocity  $v$  and elevation  $y$  of the ball above the ground at any time. (4 marks)
- ii. Determine the highest elevation reached by the ball and corresponding value of  $t$ . (4 marks)
- iii. Determine the time when the ball will hit the ground and corresponding velocity. (4 marks)

**QUESTION 4**

Collar A and block B are connected by a cable passing over three pulleys C, D and E as shown in Figure 3. Pulleys C and E are fixed, while D is attached to a collar which is pulled downward with a constant velocity of  $0.075\text{m/s}$ . At  $t = 0$ , collar A starts moving downward from position K with a constant acceleration and no initial velocity. Knowing that the velocity of collar A is  $0.3\text{m/s}$  as it passes through point L.

**Figure 3**

- i. Determine the change in elevation. (4 marks)
- ii. Determine the velocity and the acceleration of block B when collar A passes through L. (4 marks)

-----End of question-----

