

**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.

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

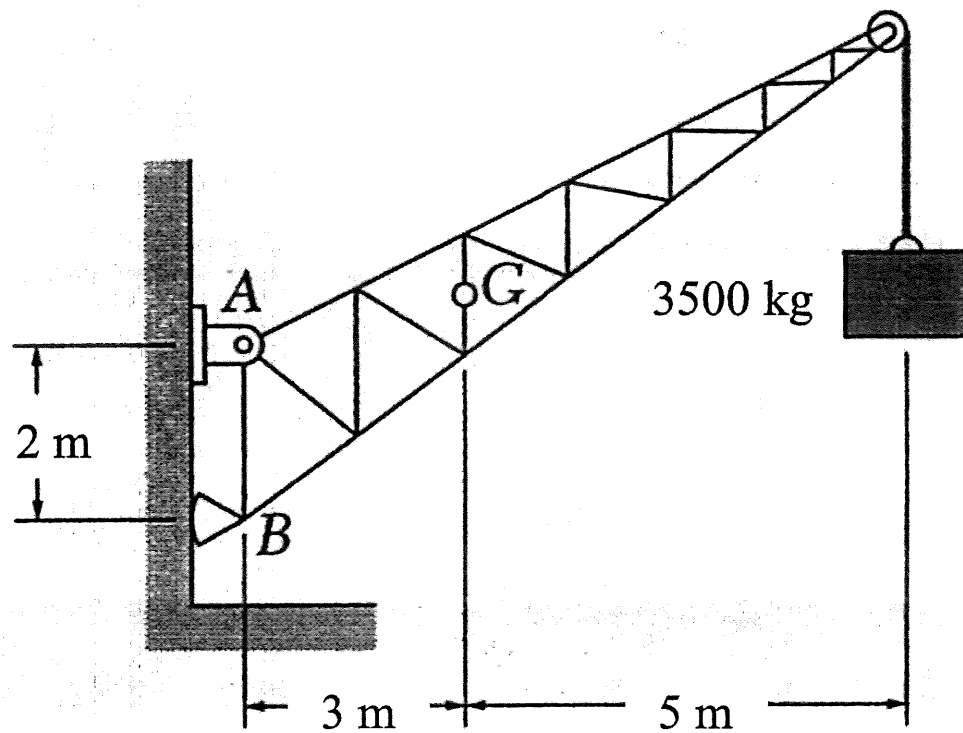
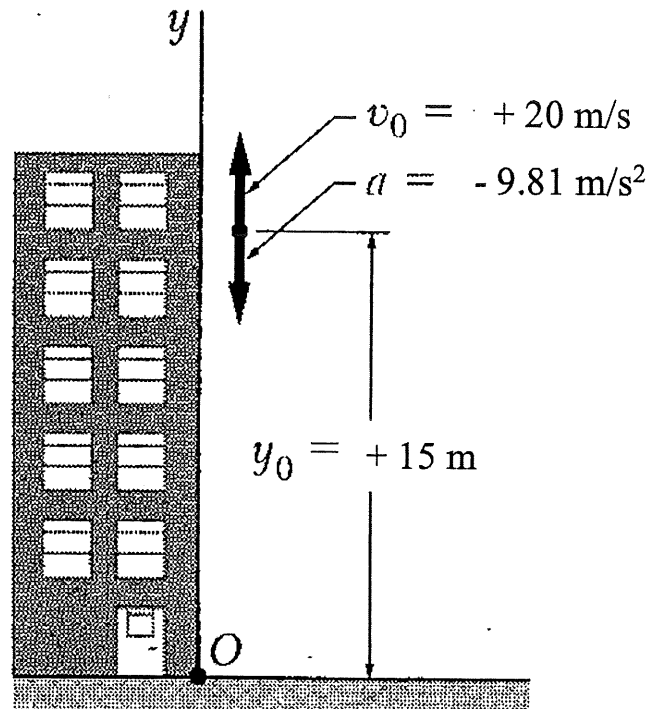


Figure 1

QUESTION 3

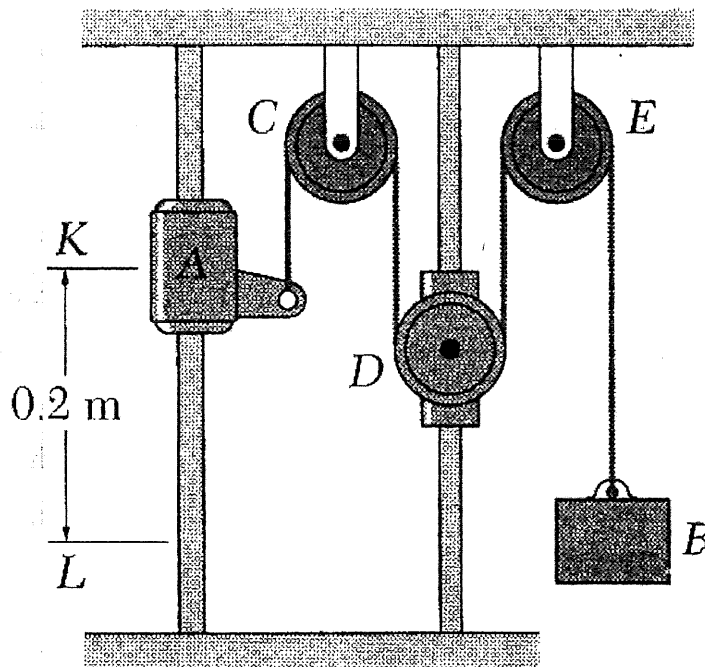
A ball in Figure 2 is tossed with a velocity of 10m/s directed vertically, upward from a window located 20m above ground. Knowing that the acceleration of the ball is constant and equal to 9.81m/s^2 downward.

**Figure 2**

- Determine the velocity v and elevation y of the ball above the ground at any time. (4 marks)
- Determine the highest elevation reached by the ball and corresponding value of t . (4 marks)
- 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 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 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-----

