



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: DGE 1312
COURSE TITLE	: FUNDAMENTAL OF PHYSICS
SEMESTER/SESSION	: 1 - 2023/2024
DURATION	: 3 HOURS

Instructions:

1. This booklet contains FIVE (5) questions. Answer ALL questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up 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

INSTRUCTION: ANSWER ALL QUESTIONS**QUESTION 1**

- a) Define scalar and vector quantities. Give TWO (2) examples for each. (4 Marks)
- b) The density of propane is 36.28 lb/ft^3 . Convert the value of density to kg/m^3 .
(1 lb = 454 g, 1 in. = 2.54 cm, 1 ft = 12 in.) (4 Marks)
- c) Three forces act on a point: 3 N at 40° , 4 N at 150° and 5 N at 270° . Determine the net force. (6 Marks)

QUESTION 2

- a) A cyclist rides 10 km east in 30 minutes then turns around and rides 8 km west in 20 minutes. Calculate the cyclist's average velocity for the entire trip. (2 Marks)
- b) Aina is waiting at a stoplight. When it was finally green, Aina accelerated from rest at a rate of 6.00 m/s^2 for a time of 4.10 seconds. Determine the displacement of Aina's car during this time period. (3 Marks)
- c) A body falls freely from rest, from a height of 30 m.
- Calculate the speed with which it strikes the ground. (3 Marks)
 - Find the time it takes to reach the ground. (2 Marks)

d) The speed-time graph represents the motion of a car as shown below in Figure 1:

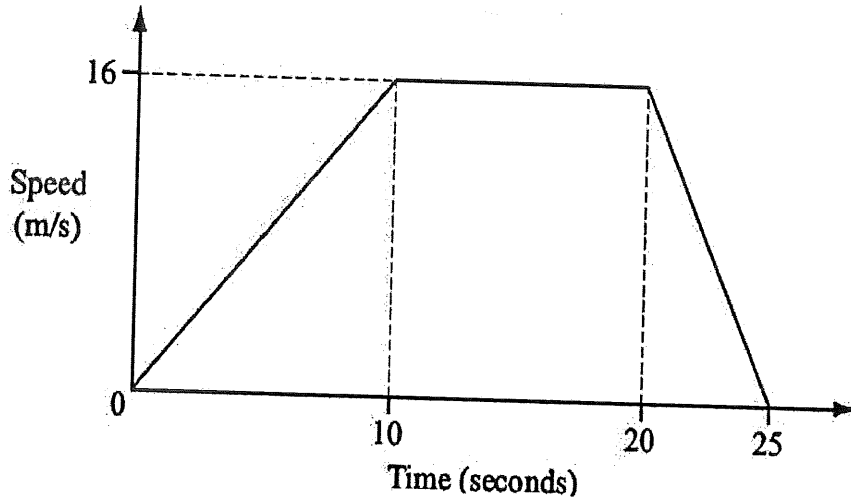


Figure 1

- i) Summarize the motion of the car. (3 Marks)
- ii) Find the total distance travelled. (2 Marks)
- iii) Determine the average speed throughout the journey. (2 Marks)
- iv) Sketch an acceleration-time graph based on the motion of the car above. (5 Marks)

QUESTION 3

- a) Define the rotational motion. (2 Marks)
- b) Give FOUR (4) examples of rotational motion. (4 Marks)
- c) An object completes 1.5 circular orbits in half a minute. Determine its approximate angular velocity. (4 Marks)

- d) A disk with a diameter of 60 cm speeds up from 20 rad/s to 40 rad/s in 5 seconds.
- Calculate the number of revolutions will the disk go through during that time period. (7 Marks)
 - Find the average linear acceleration of the disk. (4 Marks)

QUESTION 4

- State FOUR (4) types of forces. (4 Marks)
- Write down FOUR (4) steps in sketching free body diagrams. (4 Marks)
- State TWO (2) conditions for a body to be in equilibrium. (2 Marks)
- Two window washers, with masses $m_1 = 70$ kg and $m_2 = 65$ kg, stand on a scaffold with their bucket of tools $m_3 = 36$ kg. The scaffold has a mass $M = 120$ kg. Calculate the forces in the supporting ropes F_1 and F_2 . (12 Marks)

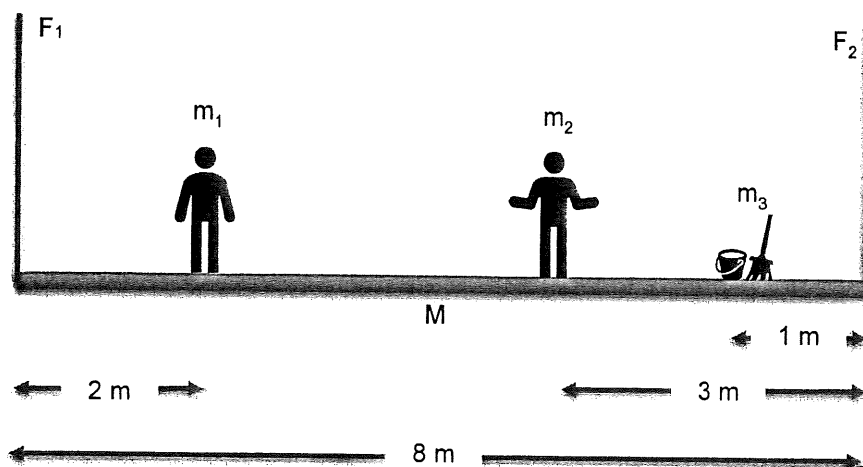


Figure 2

QUESTION 5

- a) Define work. (2 Marks)
- b) Explain work energy theorem. (4 Marks)
- c) A weightlifter lifts a 100 kg bar. He lifts it, so that its center of mass is 1.80 m higher above the ground than at the start. Determine how much work has he done against gravity. (2 Marks)
- d) A skier waits at the top of a 11.7 m hill. He then skis down the slope at an angle of 27° above horizontal. Calculate his velocity be at the bottom of the hill. (8 Marks)
- e) A lift motor has to move a fully laden lift 4 m between floors in 1.5 s. The lift has a mass of 1850 kg (ignore friction). Find the minimum power of the motor to raise the lift at a steady speed. (3 Marks)
- f) An electric current drives an electric motor to raise a 25 N weight by a vertical distance of 1.2 m. The electrical work done by the power supply is 47 J. Determine the efficiency of this process. (2 Marks)

-----END OF QUESTIONS-----

