UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: FGE 1314
COURSE	: PHYSICS I
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 6 PRINTED PAGES INCLUDING COVER PAGE

INSTRUCTION: ANSWER ALL THE QUESTIONS

QUESTION 1

a) Hakimi walks north 5 miles and then goes west 3 miles before coming straight back south 5 miles.

i) Find the speed and velocity if it takes him 4.5 hours to finish the full route. Give the answer in miles per hour. (2 Marks)

ii) Convert your answer in meters per second for speed. (2 Marks)

b) The speed-time graph (Figure 1) represents the linear motion of a car.

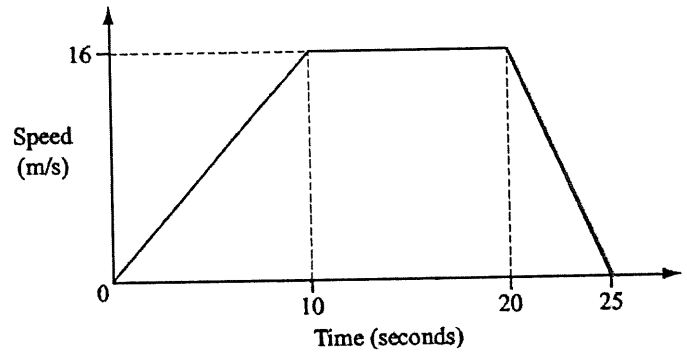

Figure1: Speed vs Time graph

i) Describe the motion of the car for each segment. (3 Marks)

ii) Determine the total distance travelled. (2 Marks)

iii) Find the average speed throughout the journey. (1 Mark)

iv) Sketch an acceleration-time graph based on the motion of the car above. (3 Marks)

c) A particle is projected vertically upwards with a speed of 10 m/s. Calculate the maximum height reached by the particle. (2 Marks)

d) Define circular motion and give two (2) examples of the motion. (3 Marks)

QUESTION 2

a) A push or pull is defined as a force. Its impact on an object is possible. List down four (4) force effects. (4 Marks)

b) State the step required in order to sketch an appropriate free-body diagram. (2 Marks)

c) A parcel of mass 2 kg is pushed with a horizontal force P, as shown in Figure 2. So that it accelerates across a horizontal surface at a rate of 1.25 m/s^2.

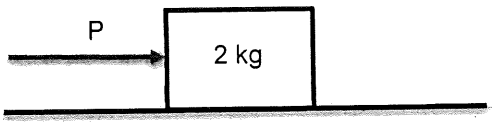

Figure 2

i) Draw a free-body diagram showing the forces acting on the parcel. (2 Marks)

ii) If the coefficient of friction is 0.5, calculate the value of P when the parcel is accelerating. (2 Marks)

d) Block A and Block B are connected by a light string. Block A of mass 2 kg lies on a horizontal surface while Block B of mass 5 kg is suspended in air. The coefficient of friction of the surface is 0.2. Determine the acceleration of each object and the tension in the string. (8 Marks)

QUESTION 5

a) Define Archimedes Principle. (2 Marks)

b) State four (4) applications of the Pascal Principle. (4 Marks)

c) The large piston in a hydraulic lift has a radius of 20 cm.

i) Calculate the force that must be applied to the small piston of radius 2.0 cm to raise a car of mass 1500 kg. (3 Marks)

ii) Determine a mechanical advantage for the system. (2 Marks)

iii) Find work done to lift the car to a height of 30 cm. (2 Marks)

d) Water at a gauge pressure of 3.8 atm at street level flows into an office building at a speed of 0.06 m/s through a pipe 5.0 cm in diameter. The pipes taper down to 2.6 cm in diameter by the top floor, 20 m above. Calculate the flow velocity and the gauge pressure in such a pipe on the top floor. Assume no branch pipe and ignore viscosity. (5 Marks)

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

FORMULA

1 miles = 1.609 km

$v = u + a\,t$

$F = m\,a$

$\tau = F\,d$

$PE = m\,g\,h$

$Q = m\,c\,\Delta\theta$

$F_1/A_1 = F_2/A_2$

$A_1v_1 = A_2v_2$

$s = u + \frac{1}{2}\,at^2$

$g = 9.81\ m/s^2$

$W = F\,d$

$KE = \frac{1}{2}\,m\,v^2$

$MA = F_o/F_i$

$P + \rho gh + \frac{1}{2}\,\rho v^2 = \text{constant}$

$v^2 = u^2 + 2as$

$F_f = \mu\,F_N$

$P = W/t$

$TME = PE + KE$

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FINAL EXAMINATION QUESTION BOOKLET	
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COURSE	: PHYSICS I
SEMESTER/SESSION	: 1 - 2023/2024 (SEPT. INTAKE)
DURATION	: 3 HOURS

Instructions:

1. This booklet contains six (6) questions. Answer ALL questions.
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INSTRUCTION: ANSWER ALL THE QUESTIONS

QUESTION 1

a) Define scalar and vector quantities and give two (2) examples for each.

(4 Marks)

b) A car is travelling at a speed of 35 m/s. Calculate its speed in kilometers per hour. Is it exceeding the 90 km/h speed limit? (4 Marks)

QUESTION 2

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

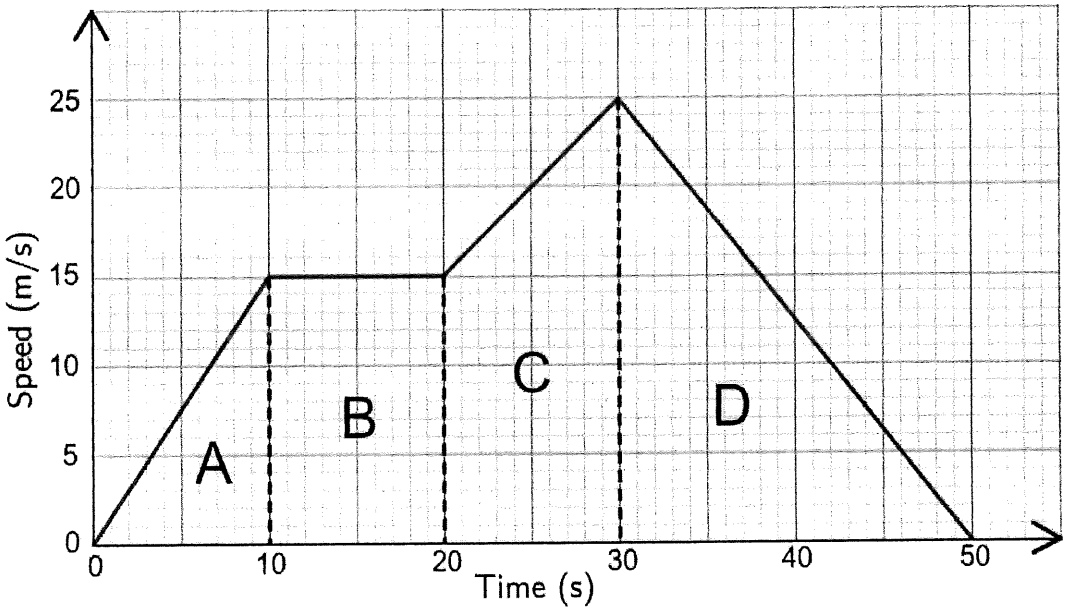

Figure 1

i) Summarize the motion of the car. (4 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.

(4 Marks)

b) A body falls freely from rest, from a height of 25 m.

i) Calculate the speed with which it strikes the ground. (3 Marks)

ii) Find the time it takes to reach the ground. (2 Marks)

QUESTION 3

a) State four (4) types of forces. (4 Marks)

b) Three forces act on a point: 3 N at 0°, 4 N at 90° and 5 N at 217°. Determine the net force. (6 Marks)

c) Write down two (2) purposes of a free body diagram. (2 Marks)

d) A 1.31-kg block sits on a lab table. The block accelerates to the right at a rate of 3.10 m/s^2. There is a backwards force of 2.80 N. Determine the force pulling the block forward. (4 Marks)

e) Three masses are attached to a uniform meter stick as shown in Figure 2. The mass of the meter stick is 150 g and the masses to the left of the fulcrum are m_1=50 g and m_2=75 g. Calculate the mass m_3 that balances the system when it is attached at the right end of the stick. (9 Marks)

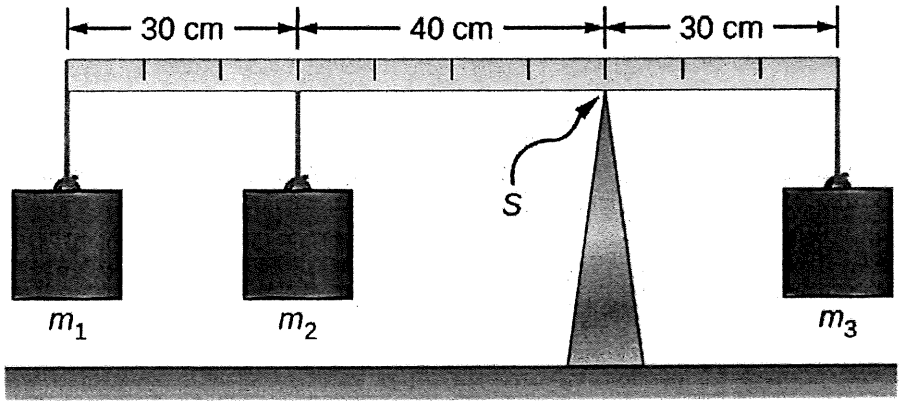

Figure 2

QUESTION 4

a) Define work. (3 Marks)

b) Explain about work energy theorem. (3 Marks)

c) A weightlifter lifts a 100 weighted bar. He lifts it, so that its center of mass is 1.80 m higher above the ground than at the start. Determine the value of much work has he done against gravity. (3 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)

QUESTION 5

a) Define the following:

i) Thermal equilibrium (3 Marks)

ii) Specific heat capacity (3 Marks)

iii) Conductor and insulator (2 Marks)

b) The steel bed of a suspension bridge is 200 m long at 20°C. If the extremes of temperature to which it might be exposed are -30°C and +40°C, determine the contraction and expansion. (2 Marks)

c) Suppose 25 mL of water at 78°C is mixed with 38 mL of water at 15°C. After equilibrium has been reached, determine the new temperature of the mixture. (3 Marks)

d) State the (3) three modes of heat transfer. (3 Marks)

QUESTION 6

a) Define Archimedes Principle. (2 Marks)

b) State three (3) applications of the Pascal Principle. (3 Marks)

c) The large piston in a hydraulic lift has a radius of 20 cm.

i) Calculate the force that must be applied to the small piston of radius 2.0 cm to raise a car of mass 1500 kg. (3 Marks)

ii) Determine a mechanical advantage for the system. (2 Marks)

iii) Find work done to lift the car to a height of 30 cm. (2 Marks)

d) Water at a gauge pressure of 3.8 atm at street level flows in to an office building at a speed of 0.06 m/s through a pipe 5.0 cm in diameter. The pipes taper down to 2.6 cm in diameter by the top floor, 20 m above. Calculate the flow velocity and the gauge pressure in such a pipe on the top floor. Assume no branch pipe and ignore viscosity. (5 Marks)

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