



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: DGE 1312
COURSE	: FUNDAMENTAL OF PHYSICS
SEMESTER/SESSION	: 1 - 2022/2023
DURATION	: 3 HOURS

Instructions:

1. This booklet contains FIVE (5) questions. Answer ALL questions.
2. All answers should be written in the 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 THE COVER PAGE

INSTRUCTION: ANSWER ALL THE QUESTIONS**QUESTION 1**

- a) Define scalar and vector quantities and give TWO (2) examples for each. (4 Mark)
- b) Three forces act on a point: 3 N at 0° , 4 N at 90° and 5 N at 217° . Determine the resultant force. (6 Marks)
- c) A car is traveling at a speed of 35 m/s. Calculate its speed in kilometers per hour and state whether it is exceeding the 90 km/h speed limit or not. (4 Marks)

QUESTION 2

- a) Distinguish between the terms distance and displacement. (2 Marks)
- b) A car can go from point A to point B in 3 hours and back in 5 hours. Along a straight route, point A and point B are 150 miles apart. Determine the car's speed and velocity during the journey. (3 Marks)
- c) A speeding bus is traveling at a constant speed of 10 m/s on a straight road. It passes a stationary car that immediately accelerates from rest with an acceleration of 2.5 m/s^2 . Calculate the time it takes for the car to overtake the bus. (2 Marks)
- d) A car travels at a constant 5 m/s in 10 s, then accelerated 1 m/s^2 in 5 s. Then decelerates until rest after the car travels 137.5 m. Sketch the graph velocity versus time to describe the object's travels. (7 Marks)

- e) A boy throws a stone vertically upwards into the air and catches it 5 s later. Neglecting air resistance.
- i) Calculate the velocity of the stone when it was thrown. (2 Marks)
 - ii) Determine the maximum height reached by the stone. (2 Marks)
- f) A body falls freely from rest, from a height of 25 m.
- i) Calculate the speed with which it strikes the ground. (2 Marks)
 - ii) Determine the time it takes to reach the ground. (2 Marks)

QUESTION 3

- a) A rope is wrapped many times around a drum of a radius of 50 cm.
- i) Determine a revolutions of the drum are required to raise a bucket to a height of 20 m. (3 Marks)
 - ii) Calculate the angular velocity of the drum if it lifts the bucket to 10 m in 5 s? (3 Marks)
 - iii) Determine the frequency of revolution for the drum. (4 Marks)
- b) A bicycle tire has a radius of 25 cm. Determine the distance travelled by the bike if the wheel turns 400 times. (4 Marks)
- c) The block is lifted from rest until the angular velocity of the drum is 16 rad/s after a time of 4 s. Calculate the average angular acceleration. (2 Marks)
- d) After 50 revolutions, a disc with a radius of 50 cm moving at 600 rev/min comes to a halt. Determine the acceleration of the disc. (5 Marks)

QUESTION 4

- a) State TWO (2) types of forces and give 2 examples for each. (6 Marks)
- b) A girl is riding her skateboard down the road and increases her speed from 1 m/s to 4 m/s in 2.5 s. If the force driving her forward is 72 N, calculate the combined mass of the girl and the skateboard. (2 Marks)
- c) List down FOUR (4) steps in creating a free body diagram. (4 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 backward force of 2.80 N. Determine the force pulling the block forward. (2 Marks)
- e) A 50-kg person stands 1.5 m away from one end of a uniform 6.0 m long scaffold of mass 70.0 kg as shown in Figure 1. Calculate the tensions in the two vertical ropes supporting the scaffold (8 Marks)

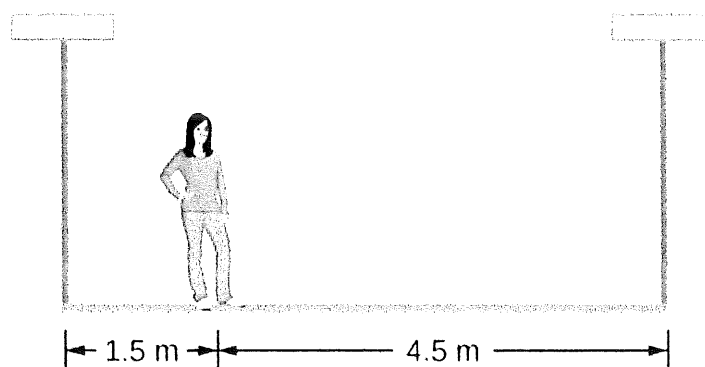


Figure 1

QUESTION 5

- a) Define the concept of 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 an 11.7 m hill. He then skis down the slope at an angle of 27° above horizontal. Calculate his velocity at the bottom of the hill. (8 Marks)
- e) A child of mass 35 kg runs up a flight of stairs in 10 seconds. The vertical distance climbed is 4 m. Assuming that the child's speed is constant, determine the power output. (4 Marks)

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

APPENDICES

$$v = u + at$$

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

$$s = \left(\frac{u + v}{2}\right) t$$

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

$$g = 9.81 \frac{m}{s^2}$$

$$1 \text{ revolution} = 2\pi \text{ radian}$$

$$s = r\theta$$

$$\omega = 2\pi f$$

$$\text{Force} = ma$$

$$\text{Torque} = F \cdot d$$

$$PE = mgh$$

$$\text{Work} = F \cdot d$$

$$TME = PE + KE$$

$$KE = \frac{1}{2}mv^2$$