

- d) A passenger of mass 72kg stands on a scale inside an elevator cabin.
For this motion; determine
- the scale reading when the cab is stationary
 - the scale reading when the cab is accelerating upwards at 3.20m/s^2
 - the acceleration when the scale reading is 477N.
- (6 marks)

QUESTION TWO (20 MARKS)

- a) A particle under constant deceleration is moving in a straight line and covers a distance of 20m in the first 2 seconds and 40m in the next 5 seconds. Determine
- The distance covered in the subsequent 3 seconds
 - The total distance covered before it comes to rest
- (8 marks)
- b) Show that for a body projected vertically upwards, its velocity at any height is the same during the upward and downward motion
- (4 marks)
- c) A steel ball is shot vertically upwards from the top of a building 25m above the ground with an initial velocity of 18m/s; Determine
- The time it takes to reach the maximum height
 - The maximum height to which the ball rises above the building
 - The velocity with which the ball strikes the ground
 - The total time the ball is in flight
- (8 marks)

QUESTION THREE (20 MARKS)

- a) i State Newton's second law of motion
- ii From Newton's second law stated in a(i) above, show that
- $F = ma$** where the symbols have the usual meaning
- (5 marks)
- b) Two bodies weighing 300N and 450N respectively are hung to the ends of a cable which passes over a frictionless pulley as shown in Figure Q3;

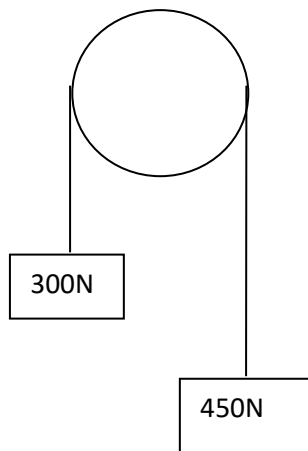


Fig Q3

Determine:

- i The acceleration of the 450N body
 - ii The tension in the cable (7 marks)
- c)
- i State D'Alemberts principle
 - ii Two bodies are connected and acted upon by a 500N force as shown in Fig Q.4C. Assuming a co-efficient friction of 0.25 between the surfaces in contact, determine the resulting acceleration of the system.

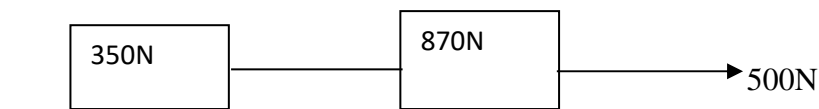


Fig Q4C

QUESTION FOUR (20 MARKS)

- a)
 - i outline the significance of Area moment of Inertia
 - ii Explain the two theorems of moment of Inertia
 - iii Derive the equation for the moment of inertia of a triangular section of base **b** and height **h** about its centroidal axis (10 marks)
- b) The cross section of a structural member is as shown in **Fig.4b**

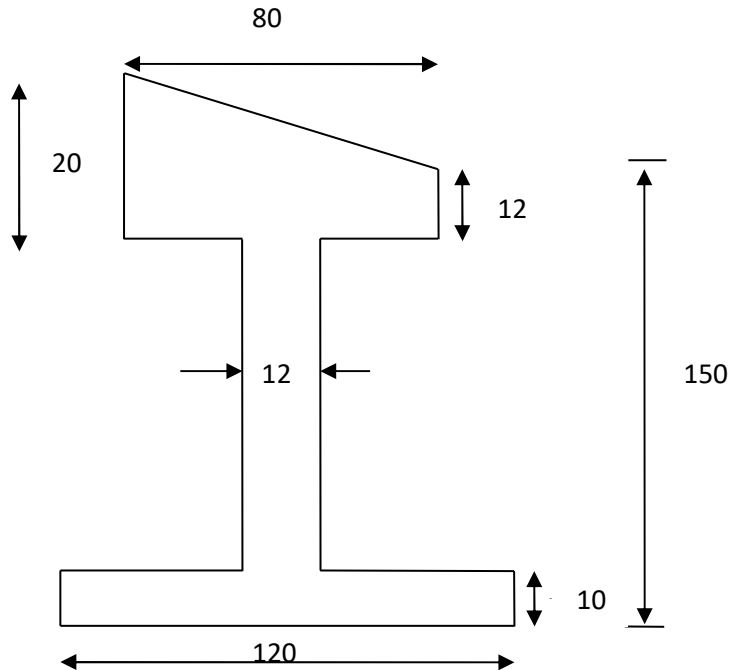


Fig.4b: All dimensions are in mm

Determine the area moment of inertia of the section about a centroidal axis parallel to the base (10 marks)

QUESTION FIVE (20 MARKS)

- a)
 - i Distinguish between angular and centripetal acceleration
 - ii Show clearly that for a body revolving about a fixed centre of rotation, the centripetal acceleration, a_c and the linear velocity, v are governed by the relationship: $a_c = \frac{v^2}{r}$ where r is the radius of rotation (8 marks)
- b) A certain force gives an object of mass m_1 an acceleration of 12.0 m/s^2 and an object of mass m_2 an acceleration of 3.30 m/s^2 . Determine the acceleration which this force would impart to an object of mass;
 - i. $(m_1 + m_2)$
 - ii. $(m_2 - m_1)$ (6 marks)
- c) A motorist travelling at 70Kph suddenly applies his brakes and brings his vehicle to a halt after skidding over a distance of 50m. Determine:
 - i the time required to stop the vehicle.
 - ii the co-efficient of friction between the vehicle tires and the road surface. (6 marks)