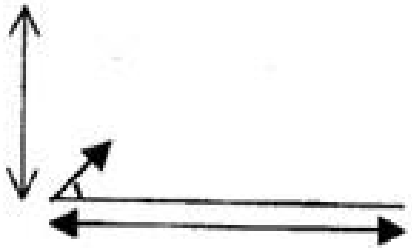
Q3(a) A ball is thrown with a speed of 40m/s at a certain angle θ with the horizontal.

(i) What is the maximum horizontal distance it can go given that the maximum height reached is 30 meters ?

(ii) Find also this angle. [10]



b) A helicopter is climbing vertically at 8.0m/s when it drops a pump near a leaking boat. The pump reaches the water 4.0 sec afterward. How high was the helicopter from the water when the pump was dropped ? [10]

(b) A body is projected vertically upwards with an initial velocity of 28m/s. Another body is projected vertically upward 2 s after the first body with an initial velocity of 21 m/s.

(i) Find the height to which the first body rises.

(ii) At what time after the first body is projected are the two bodies at the same height?

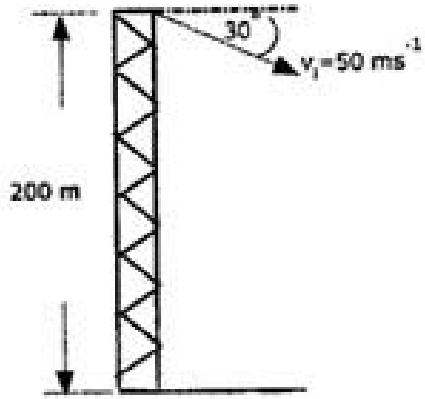
(iii) Find the velocity of each body at that instant in (ii). [12]

(b) A bullet is fired from the top of a 200 m high tower at an angle of 30° below the horizontal with a speed of 50 ms^{-1}.

i) Find the time the bullet takes to hit the ground. **[4]**

ii) What is the direct distance between the top of the tower and the point of impact on the ground? **[4]**

iii) Find the speed of the bullet when it hits the ground. **[4]**



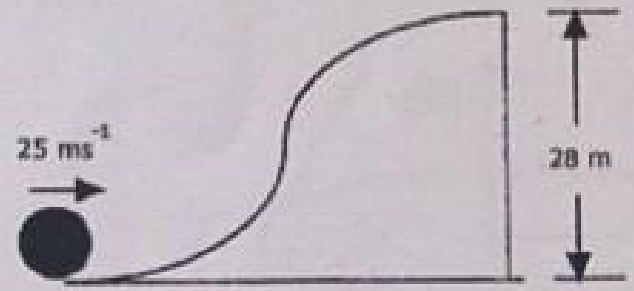
3

Q.7 (a) A stone is thrown vertically upward with a speed of 18 ms^{-1}.

i) How fast is it moving when it reaches a height of 11 m?
ii) How long does it take to reach this height?
iii) Why are there two answers to part (ii) of this question? **[10]**

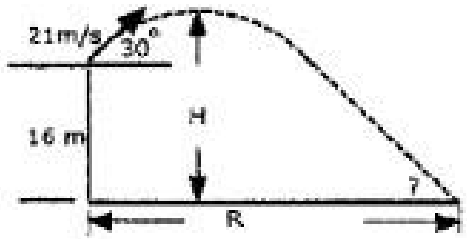
Q.6 (a) A solid, uniform ball rolls at 25 ms^{-1} without slipping up a hill as shown. At the top of the hill, it is moving horizontally and then goes over the vertical cliff 28 m deep.

i) How far from the foot of the hill does the ball land?
ii) How fast is it moving just before it hits the ground? **[12]**



(b) A stone is thrown at a velocity of 21 m/s at 30° aboe the horizontal from the top of a building 16 m high as shown below. Find:

i) the time of flight,
ii) the horizontal range, and
iii) the maximum height *H* from the ground. **[11]**



Q3(a) A girl throws a ball vertically upward at 10 m/s from the roof of a building 20 m high.

(i) How long will it take the ball to reach the ground?

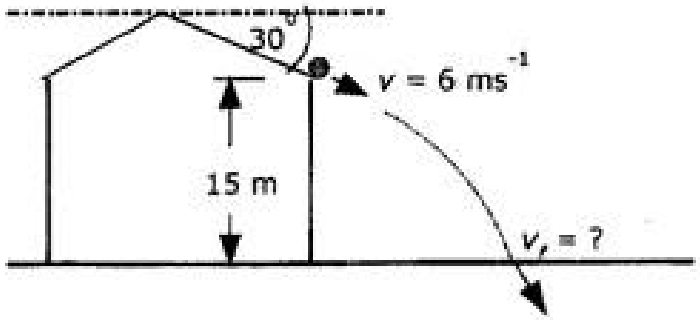
(ii) What will its velocity be just before it strikes the ground? [8]

Q4(a). A sloping roof of a building makes an angle of 30^0 with respect to the horizontal and the edge of the roof is 15 m above the ground. A ball rolling from the top of the roof attains a velocity of 6 ms^{-1} as it leaves the edge of the roof. See figure below.

i) How long does it take for the ball to hit the ground?

ii) How far horizontally from the bottom of the building does the ball strike the ground?

[7]



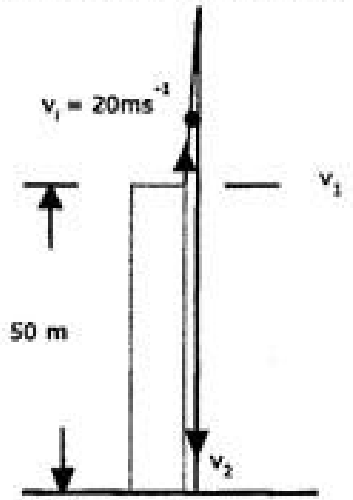
Q 2 (a) A ball is thrown vertically upward with initial velocity of 20 ms^{-1} from the top of a tower having a height of 50 m, as shown. On its return it misses the tower and finally strikes the ground.

i) What time t_1 elapses from the instant the ball is thrown until it passes the edge of the tower?

ii) What velocity v_1 does it have at this time?

iii) What is the total time t_2 required for the ball to reach ground level?

iv) What is the velocity v_2 does it strike the ground with? [14]



Q 4 (a) A ball is thrown upward at angle of 30° to the horizontal and lands on top of a building that is 20 m away, the top edge of the building is 5 m above the throwing point. How fast was the ball thrown? [10]

(c) Under what conditions can you have two dimensional motion with one dimensional acceleration? [2]

(b) A ball is thrown forward horizontally from the top of a cliff with a velocity of 10 ms^{-1}. The height of the cliff above the ground level is 45 m.
Calculate:

i) the time the ball will take before it reaches the ground,
ii) the distance between the foot of the cliff and the point of landing (i.e. horizontal distance), and
iii) the velocity of the ball just before it strikes the ground. [12]

(b) A ball is thrown vertically upward with a velocity of 25 ms^{-1} from a bridge. On the way down the ball just misses the bridge and falls into the water 6 s after having been thrown.
Find:

i) The height of the bridge above the water.

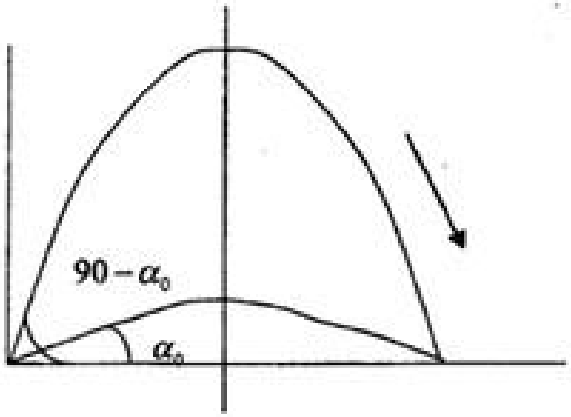
ii) The velocity of the ball just before it hits the water. [12]

3 (a) A golf ball flies off at angle of 30^0 above the horizontal with a speed 44 ms^{-1}.
Find:

i) How high it rises?
ii) How long it is in the air?
iii) How far it travels horizontally, assuming a flat golf course. [11]

(b) An object is launched at an angle α_0 w.r.t. the horizontal with a velocity v_0. It reaches a distance R_1. An identical object is launched at an angle $(90-\alpha_0)$ w.r.t. the horizontal with the same velocity. It reaches a distance R_2.
Show that $R_1 = R_2$.

[8]



Q5(a) A ball is thrown vertically upward from the ground with a speed of 24.4 m/s. [15]

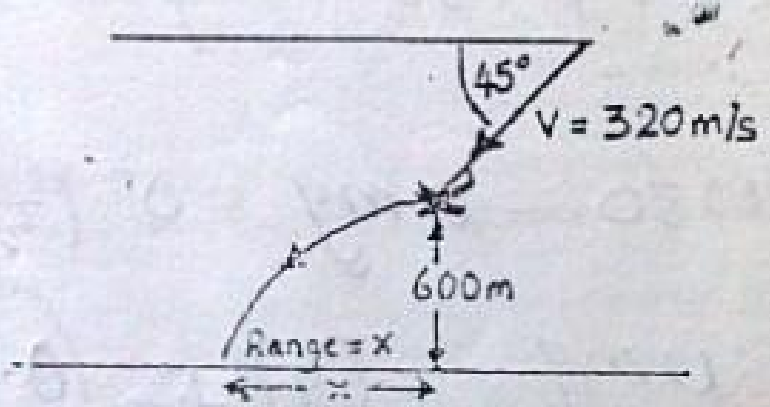
(i) How high does the ball rise?

(ii) At what two times will the ball be 29m above the ground?

(iii) What will be the corresponding velocities at 29m above the ground?

Q 3 (c). A bomber is diving toward its target at an angle of 45 degrees below the horizontal and at a speed of 320 m/s. When the bomber is 600 m above the ground, it releases its load, which then hits the target.

a) How long will it take the bomb to reach the target?
b) What horizontal distance will it travel?
c) With what speed will it strike the target? [10]



(b) A stone is shot from a catapult at an angle of 60° with respect to level ground. It leaves the catapult at a height of 1.7 m above ground level. It has an initial velocity of 10 ms^{-1}.

I) What is the maximum height of the stone with respect to ground level?
II) How long does it take to hit the ground?
III) What is the horizontal distance travelled by the stone at the point it hits the ground with respect to the foot of the launch point? **[11]**

Q 2 (a) A stone is thrown from the top of a building with initial velocity of 20 ms^{-1} straight upward. The building is 50 m high, and the stone just misses the edge of the roof on its way down. Determine:

i) the time needed for the stone to reach its maximum height,
ii) the maximum height it reaches,
iii) the time needed for the same stone to return to the level of the thrower,
iv) the velocity of the stone at this instant, and
v) the velocity and position of the stone at $t = 5s$. [12]