

Circular Motion - Questions by Topic

Q1.

A DVD is rotating at 570 rotations per minute.

What is its angular velocity in radians per second?

(1)

- A** 1.5
- B** 10
- C** 60
- D** 3600

(Total for question = 1 mark)

Q2.

The International Space Station (ISS) completes 16 orbits of the Earth every 24 hours.
The ISS is 330 km above the surface of the Earth.

(a) Show that the angular velocity of the ISS around the Earth is about $1 \times 10^{-3} \text{ rad s}^{-1}$.

(2)

.....

.....

.....

.....

(b) Calculate the acceleration of the ISS in this orbit.

radius of Earth = 6400 km

(2)

.....
.....
.....
.....

Acceleration of the ISS =

(Total for question = 4 marks)

Q3.

The photograph shows the drum inside a washing machine.



The drum is a hollow metal cylinder with a series of holes through its surface. During the spin cycle the drum rotates at 1400 revolutions per minute to separate the water from the wet clothes.

(a) (i) Show that the speed of the point X on the rotating drum is about 35 m s^{-1} .

diameter of drum = 0.480 m

(2)

.....
.....
.....
.....

(ii) A shirt button remains at a single point on the drum as the drum spins.

Calculate the centripetal force acting on the shirt button.

mass of shirt button = 1.4 g

(2)

.....
.....
.....
.....

Centripetal force =

(b) Explain how the drum spinning separates water from the wet clothes.

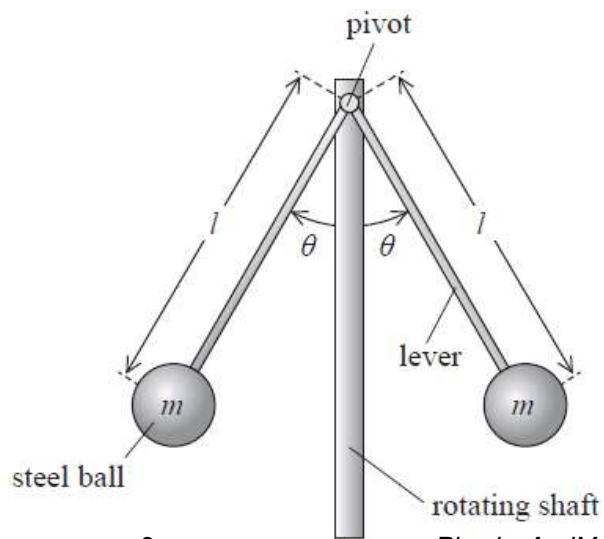
(2)

.....
.....
.....
.....
.....

(Total for question = 6 marks)

Q4.

Steam engines can have their speed controlled by the device shown in the photograph. A simplified diagram of the device is shown on the right.



Two steel balls, each of mass m , can move apart at the end of levers that are freely pivoted. As the vertical shaft rotates, the two steel balls move apart so that the angle between the lever and the vertical is θ .

This action is linked to a valve that reduces the flow of steam, reducing the speed of the engine.

(a) Complete a free-body force diagram to show the forces acting on one of the steel balls when the shaft is rotating.

(2)



(b) The shaft is rotating at 62 revolutions per minute.

Calculate the angle θ

$$m = 5.1 \text{ kg}$$

$$l = 270 \text{ mm}$$

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

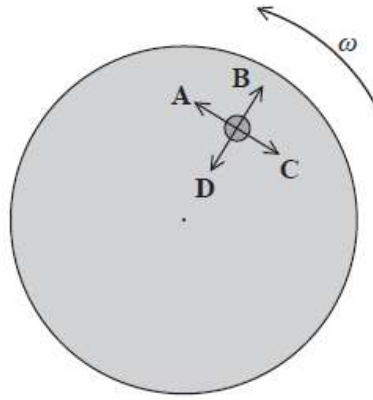
$$\theta =$$

(Total for question = 8 marks)

Q5.

The diagram shows a coin on a horizontal surface which is rotating at a constant angular velocity ω .

Which arrow correctly shows the direction of the frictional force on the coin?



A

B

C

D

(Total for question = 1 mark)