Universiti Tun Hussein Onn Malaysia

# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## (ONLINE)
## SEMESTER I
## SESSION 2020/2021

| | | |
|---|---|---|
| COURSE NAME | : | PHYSICS |
| COURSE CODE | : | DAM 13202 / DAM 10503 |
| PROGRAMME CODE | : | DAM |
| EXAMINATION DATE | : | JANUARY / FEBRUARY 2021 |
| DURATION | : | 3 HOURS |
| INSTRUCTIONS | : | ANSWER **FIVE (5)** QUESTIONS ONLY |



THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

**Q1** (a) State **two (2)** categories of physical quantity.

(? marks)

(b) Give an example for each physical quantities stated in **Q1 (a)**.

(2 marks)

(c) The radius of the moon is approximately $1.74 \times 10^3$ km. Calculate

(i) its surface area in $mm^2$.

(3 marks)

(ii) its volume in $km^3$.

(? marks)

(iii) its circumference in cm.

(? marks)

(c) The energy stored in a wire, $E$, of cross sectional area , A, when it is streched from $l$ to $(l+x)$ cm is given by

$$E = \frac{2\gamma A (l+x)^2}{3l}.$$

where $E$ = energy stored in a wire, A = cross sectional area of the wire, $\gamma$ = Young Modulus of a wire, $x$ = distance of a stretched wire, and $l$ = length of the wire. The equation is dimensionally correct . Find

(i) the dimensional analysis of the Young Modulus, $\gamma$.

(8 marks)

(ii) the SI unit of the Young Modulus, $\gamma$.

(1 mark)

**Q2** **Figure Q2 (a)** shows three force vectors **A, B** and **C** acting on an object at the origin of the $x$-$y$ plane. If resultant vector **G** = - **(A – 2B)** + **C**, determine

(a) the $x$ and $y$ components of vector **G**.

(10 marks)

(b) the magnitude and direction of vector **G**

(6 marks)

(c) the unit vector **G**.

(4 marks)

**Q3** A ball is projected forward at an angle $35^0$, so that the motion of the ball is in parabolic shape of motion. The initial velocity of the ball 40 $ms^{-1}$. Calculate

(a) the velocity of the ball at time $t = 0.2$ s.

(7 marks)

(b) the time taken for the ball to reach the maximum height

(3 marks)

(c) the maximum height that the ball can reach.

(3 marks)

(d) the horizontal range the ball can reach.

(4 marks)

(e) Sketch a graph of velocity ($ms^{-1}$) versus time (s) for the ball from its initial to final position.

(3 marks)

**Q4** Block D with mass 3.5 kg on a horizontal surface of a table is connected to Block E with mass 1.8 kg by an inelastic string passing over a light and frictionless pulley. Block F is place on top of Block D as shown in **Figure Q4 (a)**. Given the coefficient of static friction between Block D and the table is 0.25 and the gravitational acceleration is 9.81 $ms^{-2}$.

(a) Draw the free body diagram of forces acting on Block DF and Block E.

(3 marks)

(b) Determine the minimum mass of Block F to prevent Block D from sliding.

(8 marks)

(c) If Block F is lifted, calculate the acceleration of the blocks.

(8 marks)

(d) Define the coefficient of static friction.

(1 mark)

**Q5** (a) A blade of a giant ceiling fan has a radius of 2 m. The blade is rotating with initial angular velocity of 0.75 rps and the angular acceleration is 1.5 rps. Calculate:

(i) the angular velocity after 5 s

(2 marks)

(ii) the tangential speed of a point on the tip of the blade at time 5 s.

(2 marks)

(iii) the tangential acceleration of a point on the tip of the blade at time 5 s.

(2 marks)

(iv) the centripetal acceleration of a point on the tip of the blade at time 5 s.

(2 marks)

(v) the resultant acceleration of a point on the tip of the blade at time 5 s

(2 marks)

(b) Give **two (2)** examples of household equipment that use rotational motion concept.

(2 marks)

(c) A grinding wheel is spinning at a rate of 120 revolutions per second. When the power to the grinder is turned off, the grinding wheel slows with a constant angular acceleration and takes 50 s to come to rest. Calculate:

(i) the angular acceleration of the grinding wheel as it came to rest.

(4 marks)

(ii) the number of rotations of the wheel until it is come to rest.

(4 marks)

**Q6** (a) A block of mass 2.45 kg moves with velocity $v$ towards a spring as shown in **Figure Q6 (i)**. The block compresses the spring by 1.65 cm as shown in **Figure Q6 (ii)**. Given that the spring constant of the spring is 1000 $Nm^{-1}$. Calculate the velocity, $v$ of the block if

(i) the surface is smooth.

(4 marks)

(ii) the surface is rough and the frictional force between the block and the surface is 3.2 N.

(6 marks)

(b) **Figure Q6 (b)** shows a tennis ball with mass 59.4 g bouncing off the ground for several times. By considering the ground is a smooth surface and the total energy of the tennis ball is conserved, calculate

(i) The velocity of the ball at point A if its velocity at point B is 23.8 $ms^{1}$.

(7 marks)

(ii) The total energy at point D.

(3 marks)

**- END OF QUESTION-**

| | | | |
|---|---|---|---|
| SEMESTER / SESSION | : SEM I / 2020/2021 | PROGRAMME CODE | : DAM |
| COURSE NAME | : PHYSICS / APPLIED PHYSICS | COURSE CODE | : DAM 13202 / DAM 10503 |

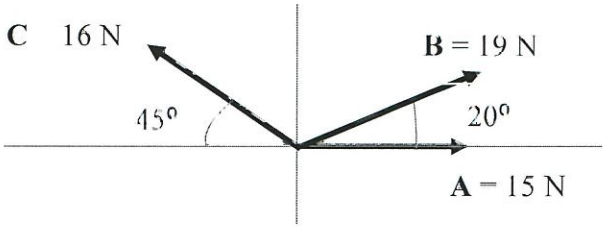


**Figure Q2 (a)**

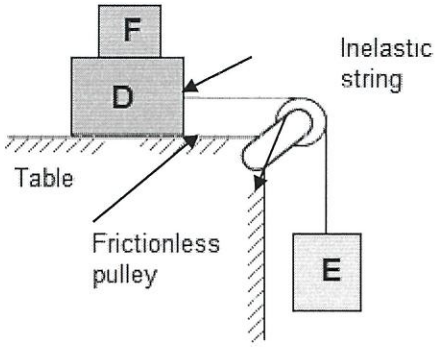


**Figure Q4 (a)**


**(i)** **(ii)**

**Figure Q6**

| | | | |
|---|---|---|---|
| SEMESTER / SESSION | : SEM I / 2020/2021 | PROGRAMME CODE | : DAM |
| COURSE NAME | : PHYSICS / APPLIED PHYSICS | COURSE CODE | : DAM 13202 / DAM 10503 |

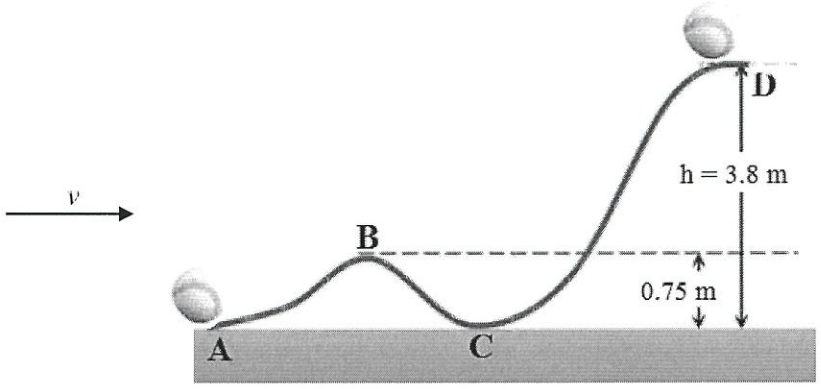


**Figure Q6 (b)**