



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : PHYSICS FOR ENGINEERING TECHNOLOGY

COURSE CODE : BWM12603

PROGRAMME CODE : BNA,BNB,BNC,BNN

EXAMINATION DATE : JANUARY/FEBRUARY 2021

DURATION : 2 HOURS 30 MINUTES

INSTRUCTION : (i) ANSWER ALL QUESTIONS IN PART A.
(ii) ANSWER ONLY THREE (3) QUESTIONS IN PART B.
OPEN BOOK EXAMINATION

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

TERBUKA

PART A

- Q1** (a) Differentiate between transverse and longitudinal wave with examples. (4 marks)
- (b) A transverse wave is moving at 4.0 ms^{-1} in the positive x -direction as in **Figure Q1 (b)**. The location, x (cm) and the displacement of the medium, y (cm) at time $t = 0$ is shown.
- (i) Determine the amplitude, wavelength and frequency of the wave. (4 marks)
- (ii) Sketch a graph that shows the relationship between displacement of the medium y (cm) at the origin ($x = 0$) against time t (s). (3 marks)
- (c) A plane wave is travelling in a direction on a surface of water. If the positive direction of x -coordinate is regarded as the same as the traveling direction of the wave, the displacement, y of the water surface at the point, x and at time, t can be represented by the equation:
- $$y(x,t) = A \sin(pt - qx)$$
- A , p , and q are all positive constants and the ratio of a circle's circumference to its diameter is π .
- (i) Determine whether the wave travels in positive or negative direction of x -axis. Provide your reason. (4 marks)
- (ii) Calculate the frequency, wavelength and the speed of the wave in terms of A , p and q . (5 marks)
- Q2** (a) A 0.5 kg aluminum pan on a stove is used to heat 0.250 liters of water from 20.0°C to 80.0°C . Calculate the:
- (i) heat transferred to the water.
(ii) heat transferred to the aluminum.
(iii) total heat transfer.
(iv) percentage of the heat required to raise the temperature of the pan and the water.
- (Given: specific heat of water is $4186 \text{ J/kg}^\circ\text{C}$, specific heat for aluminum of $900 \text{ J/kg}^\circ\text{C}$) (12 Marks)

TERBUKA

- (b) A 50.0 g copper calorimeter contains 250 g of water at 20.0°C. How much steam must be condensed into the water if the final temperature of the system is to reach 50.0 °C?
- (8 Marks)

PART B

- Q3** (a) Differentiate between scalar and vector quantity. Give an example for each quantity.
- (4 marks)

- (b) If a half marathon is 13.1 miles, how long will it take for a runner to complete the distance running at an average rate of 5 minutes and 30 seconds per kilometer? Give your answer in hours and minutes, rounding your answer to the nearest minute. (Given: 1 mile = 1.61 kilometers)
- (6 marks)

- (c) The two vectors \vec{a} and \vec{b} in **Figure Q3(c)** have equal magnitudes of 10.0 m and the angles are $\theta_1 = 30^\circ$ and $\theta_2 = 105^\circ$. Determine;

- (i) the x and y-component of their vector sum \vec{r} .
- (6 marks)

- (ii) the magnitude of \vec{r} .
- (2 marks)

- (iii) the angle of \vec{r} (the positive direction of the x-axis).
- (2 marks)

- Q4** (a) A 0.075 kg arrow is fired horizontally. The bowstring exerts an average force of 65 N on the arrow over a distance of 0.90 m. Determine the speed of the arrow leaving the bow.
- (4 marks)

- (b) A boat has a mass of 6800 kg generates a drive force of 4100 N to west direction, while the wind exerts a force of 800 N to east direction, and the water exerts a resistive force of 1200 N to east direction. Determine the magnitude and direction of the boat's acceleration?
- (4 marks)

- (c) Calculate the power required for a 60 kg person to climb a tree 5 meters high in 10 seconds. (Given: g is 10 m/s²).
- (2 marks)

- (d) State Newton's second law of motion. Write the law in mathematical form.

TERBUKA (3 marks)

- (e) **Figure Q4 (e)** shows a load of mass 500 g hung on a string C tied to 2 other strings A and B. Draw free body diagram and find the tension in string A. (7 marks)
- Q5** (a) A cylindrical object with diameter, d and height, h is submerged at x , in a fluid with density, ρ , as shown in **Figure Q5 (a)**. The gravitational acceleration is g , atmospheric pressure is P_{atm} and the ratio of a circle's circumference to its diameter is π .
- (i) State the "Archimedes principal". (1 mark)
- (ii) Determine the force due to the pressure of the liquid at the top of the cylinder. (3 marks)
- (iii) Determine the force due to the pressure of the liquid at the bottom of the cylinder. (3 marks)
- (iv) Determine the net force on the object, due to the fluid pressure. (3 marks)
- (b) A cylinder with density, ρ , height, h , radius, r , is partially submerging at static, with depth, x in a fluid with density, ρ_o , as shown in **Figure Q5(b)**. The ratio of a circle's circumference to its diameter is π .
- (i) Determine all the forces acting on the cylinder at y -direction. (6 marks)
- (ii) What must be the density of the cylinder so that it appears only 10% from its total height on the surface of the liquid? (4 marks)
- Q6** (a) One end of a steel rod of radius $R = 9.5$ mm and length $L = 81$ cm is held in a bench vise. A force of magnitude $F = 62$ kN is then applied perpendicularly to the end face (uniformly across the area) at the other end, pulling directly away from the bench vise. (Given: Young's Modulus for stainless steel is 2.0×10^{11} N/m²)
- Calculate the following;
- (i) Stress on the rod. (2 marks)
- (ii) Elongation, ΔL in the rod. (2 marks)
- (iii) Strain of the rod. (2 marks)

TERBUKA

- (b) What must be the elongation of a 5 m long so that the strain is 1% of 0.1? If the wire has cross-section of 1mm^2 and is stretched by 980 N weight. Determine the value of stress.
(4 Marks)
- (c) A temperature control system is operated by the expansion of a zinc rod which is 200 mm long at 15°C . If the system is set so that the source of heat supply is cut off when the rod has expanded by 0.20 mm, determine the temperature to which the system is limited. Assume the coefficient of linear expansion of zinc to be $31 \times 10^{-6} \text{K}^{-1}$.
(4 marks)
- (d) A glass container with volume of 4 liters filled with water, then heated until the increase in temperature is 20°C . Some water spilled. Given the coefficient of linear expansion for glass is $9 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$ and the coefficient of volume expansion for water is $2.1 \times 10^{-4} \text{ }^\circ\text{C}^{-1}$. Determine the volume of spilled water.
(6 marks)

– END OF QUESTIONS –

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2020/2021

PROGRAMME CODE : BNA/BNB/BNC/BNN

COURSE NAME : PHYSICS FOR ENGINEERING TECHNOLOGY

COURSE CODE

: BWM12603

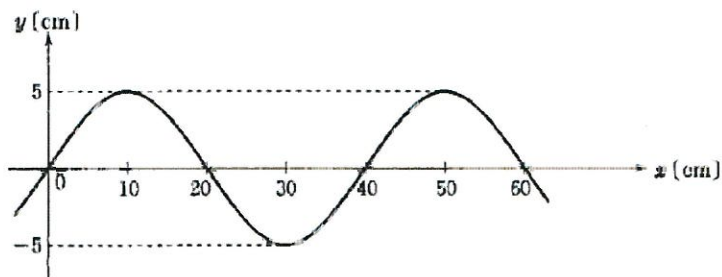


Figure Q1(b)

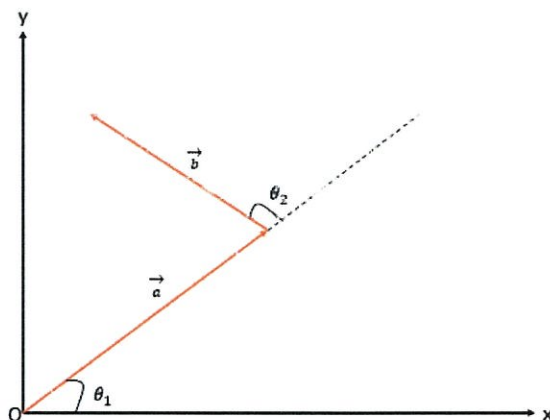


Figure Q3 (c)

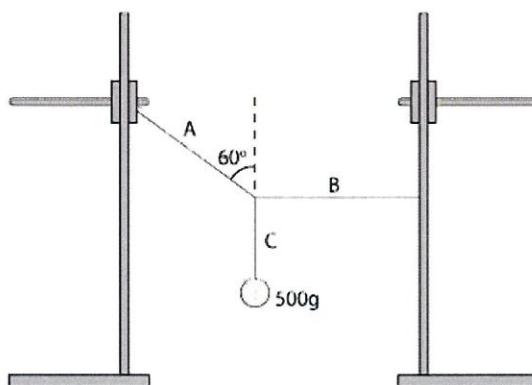


Figure Q4(e)

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2020/2021
COURSE NAME : PHYSICS FOR ENGINEERING TECHNOLOGY

PROGRAMME CODE : BNA/BNB/BNC/BNN
COURSE CODE : BWM12603

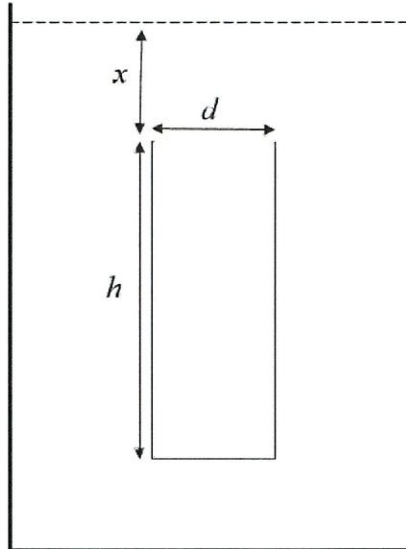


Figure Q5(a)

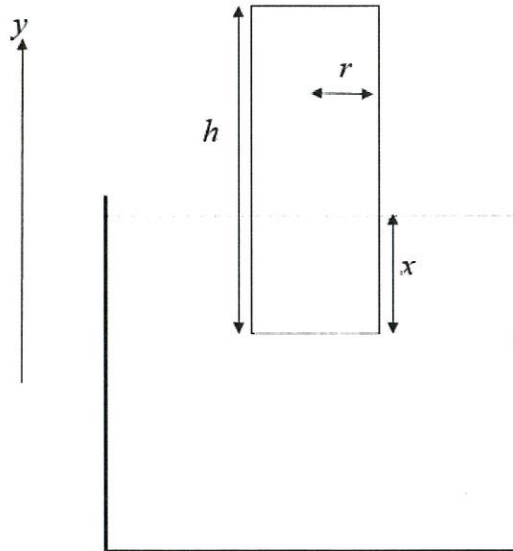


Figure Q5(b)

TERBUKA