Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	BASIC ENGINEERING SCIENCES
COURSE CODE	:	BPD 24002
PROGRAMME CODE	:	BPC
EXAMINATION DATE	:	DECEMBER 2017 / JANUARY 2018
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) State the differences between Newton's First Law and Newton's Second Law.

(4 marks)

(b) A worker pulls a light rope which has one end tied to a wooden box lying on a horizontal ground.

Describe the force acting on the wooden box, rope and the hand of the worker.

(6 marks)

(c) Ali drag a suitcase with rope along the floor of an airport terminal. The rope makes a 30^0 angle with the horizontal floor. The suitcase has a mass of 25.0 kg and Ali pulls on the rope with a force of 60 N as shown in **Figure Q1(c)**.

Calculate:

(i) Magnitude of the normal force acting on the suitcase due to the floor.

(5 marks)

(ii) Magnitude of friction force acting on the suitcase, if the coefficient of kinetic friction between the suitcase and the floor is 0.13.

(5 marks)

(iii) Magnitude of net force.

(5 marks)

Q2 (a) Explain *work-energy* theorem.

(4 marks)

(b) Muhammad Ali pulls a crate of apples of mass, m 2.0 kg along a horizontal floor with force, F of magnitude 10 N as shown in **Figure Q2(b)**. The friction force, F_f between the crate and floor is 5.0 N.

Calculate the velocity of the crate after it has travelled a distance of 5.0 m, which initial is at rest.

(6 marks)

(c) (i) When an object is immersed in a fluid, the pressure of the lower surface of the object is higher than the pressure on the upper surface. This difference in pressure leads to an upward net force acting on the object due to fluid pressure. For example, if you try

to push a ball underwater, you feel the effects of the buoyant force pushing the ball back up. The instant you let go, the ball pops back up to the surface.

Explain the effect of buoyant on object immersed in a fluid by using Archimes principle.

(5 marks)

(ii) Calculate magnitud of buoyant force on 0.90kg of ice floating freely in water.

(4 marks)

(iii) Magnitude of buoyant force on 0.90kg of ice that is held completely submerged under water. Given, density of ice (ρ_{ice}) = 917kg/m^3 and density of water (ρ_{water}) = 1000kg/m^3.

(6 marks)

Q3 (a) Heat is the energy tranferred from a system at a higher temperature to a system at a lower temperature which is in contact.

Explain **THREE (3)** types of heat transfer.

(9 marks)

(b) Calculate the amount of heat needed to increase the temperature of 300g of water from 25°C to 60°C.

(6 marks)

(c) (i) A steel bridge is built in the summer when the temperature is 35.0°C. At the time of construction its length is 100.0m. Given, $\alpha_{steel} = 1.25 \times 10^{-4} C^{-1}$.

Calculate the length of the bridge on a cold winter day when the temperature is 8.0°C.

(5 marks)

(ii) A glass flask with a volume 180cm^3 is filled to the brim with mercury at 25°C. Given the coefficient of volume expansion, β of the glass is $1.2 \times 10^{-5} K^{-1}$ and mercury is $18 \times 10^{-5} K^{-1}$.

Calculate the mercury overflow when the temperature of the system is raised to 100°C.

(5 marks)

Q4 (a) Mechanical wave is a wave that need a medium through which to transmit energy.

Describe **TWO (2)** types of mechanical waves.

(6 marks)

(b) A fisherman notices that his boat is moving up and down periodically owing to waves on the surface of the water. It takes 3.0s for boat to travel from its highest point to its lowest, a total distance of 8.0m. The fisherman sees that the wave crests are speed 8.0m apart.

Calculate the speed of waves travelling.

(4 marks)

(c) **Figure Q4(c)** shows the graph of sinusoidal wave travelling in second, s. Given the wavelength of the wave is 0.15.

Calculate:

(i) The period of the wave.

(3 marks)

(ii) The frequency of the wave.

(4 marks)

(iii) The speed of the wave.

(4 marks)

(iv) Angular frequency.

(4 marks)

- END OF QUESTIONS –

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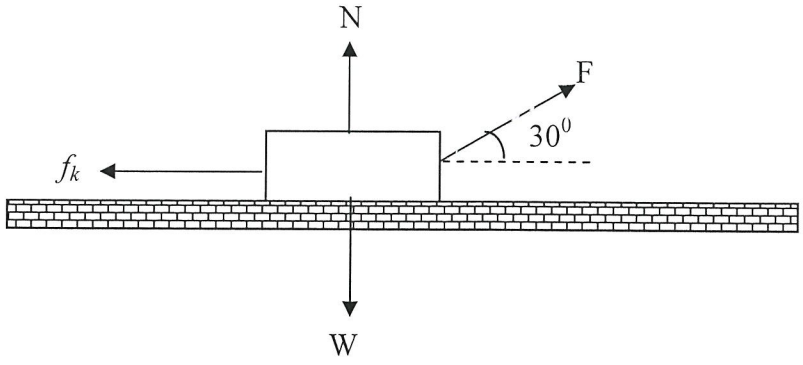

Figure Q1(c) : A Suitcase

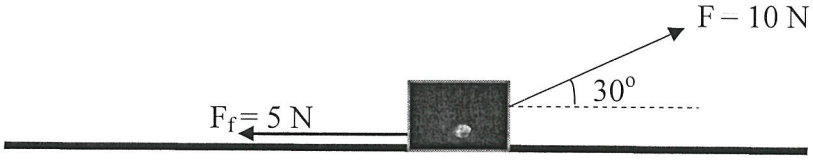

Figure Q2(b) : A Crate

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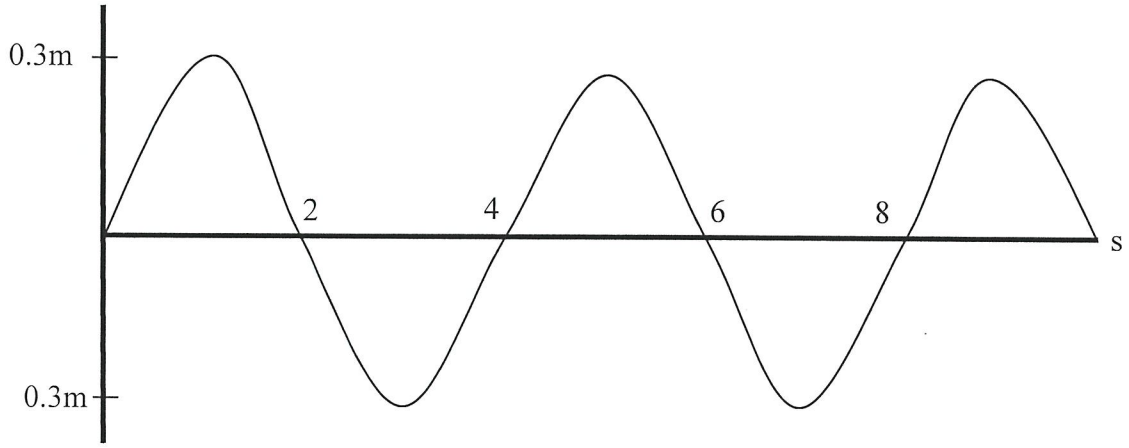

Figure Q4(c) : Sinusoidal Wave