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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017**

COURSE NAME : BASIC ENGINEERING SCIENCES
COURSE CODE : BPD 24002
PROGRAMME CODE : BPC **TERBUKA**
EXAMINATION DATE : DECEMBER 2016 / JANUARY 2017
DURATION : 2 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1 (a) State the differences between stress and strain. (4 marks)

(b) Hooke's Law states that the strain produced directly proportional to the stress applied, provided the stress is below the elastic limit.

Explain the deformation of an ideal spring when a compressive or tensile force acted on the spring by using Hooke's Law.

(6 marks)

(c) (i) A steel rod 5m long has a cross sectional area of 0.5cm^2 . The rod is now hung by one end from a support structure, and a 550kg weight is hung from the rod's lower end, causing it to elongate 2mm.

Calculate the stress and strain of the rod.

(10 marks)

(ii) The volume of oil container in a certain hydraulic press is 0.3m^3 . Given the Bulk Modulus of the oil is $B = 5.0 \times 10^9 \text{ Pa}$.

Calculate the decrease of oil volume in the container when it is subjected to a pressure increase $\Delta P = 1.6 \times 10^7 \text{ Pa}$.

(5 marks)

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Q2 (a) List **FOUR (4)** types of expansion in thermal expansion. (4 marks)

(b) Explain the effect of thermal expansion in the construction of roads and bridges. (6 marks)

(c) A solar water heating system uses solar panels on the roof, 15m above the storage tank. The pressure at the level of the panel is 1 atmosphere. Given 1 atmosphere pressure = $1.013 \times 10^5 \text{ Pa}$ and density of water = 1000kg/m^3 .

Calculate:

(i) The absolute pressure in the tank. (10 marks)

(ii) The gauge pressure. (5 marks)

Q3 (a) State the differences between diffusion and radiation heat transfer. (5 marks)

(b) Discuss the heat that can be transferred by conduction in a solid. (8 marks)

(c) (i) The specific heat of iron is $0.450 \text{ J/g}^\circ\text{C}$ and heat of water is $4.18 \text{ J/g}^\circ\text{C}$.

Calculate the final temperature when a 25g piece of iron at 85°C is placed into 75g of water at 20°C . (6 marks)

(ii) A 245.7g sample of metal at 75.2°C was placed in 115.43g water at 22.6°C . The final temperature of the water and metal was 34.6°C .

Calculate the specific heat of the metal if no heat was lost to the surroundings.

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(6 marks)

Q4 (a) Calculate the wavelength if 3000 waves are passing through a point in one minute. Given the speed of a wave in a medium is 900 m/s . (5 marks)

(b) Ocean waves are observed to travel along the water surface during a developing storm. A Coast Guard weather station observes that there is a vertical distance from high point to low point of 4.6m and a horizontal distance of 8.6m between adjacent crests. The waves splash into the station once every 6.2s.

Determine the frequency and the speed of these waves.

(8 marks)

(c) Rahman and Salmah stand 8m apart and demonstrate the motion of a transverse wave on a snaky. The wave can be described as having a vertical distance of 32cm from a trough to a crest, a frequency of 2.4Hz, and a horizontal distance of 48cm from a crest to the nearest trough.

Calculate:

(i) The amplitude of the wave.

(3 marks)

- (ii) The period of the wave. (3 marks)
- (iii) The wavelength. (3 marks)
- (iv) The speed of the wave. (3 marks)

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- END OF QUESTIONS -