UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016

COURSE NAME	:	BASIC ENGINEERING SCIENCES
COURSE CODE	:	BPD 24002
PROGRAMME	:	2 BPC
EXAMINATION DATE	:	DECEMBER 2015/JANUARY 2016
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1   (a)   Define:

(i)   Density(ρ)

(2 marks)

(ii)   Specific gravity(s.g.)

(2 marks)

(b)   By using the concept of density, the pressure increases with depth due to gravity. A glass of beaker containing static liquid of uniform density(ρ). Within this liquid, a cylinder with cross-sectional area, A and height, h as shown in Figure **Q1(b)**.

Explain the effect of gravity on fluid pressure of the cylinder.

(6 marks)

(c)   A rectangular block with weight 20kg has dimensions 10m width, 35m length and 20m height.

Calculate:

(i)   Density of the rectangular block.

(5 marks)

(ii)   Specific gravity of the rectangular block.

(5 marks)

(iii)   Pressure of the rectangular block. (Force, $F = 10$kN)

(5 marks)

Q2   (a)   State the differences between *linear expansion* and *area expansion*.

(4 marks)

(b)   Describe **THREE (3)** types of the deformation in elastic modulus.

(6 marks)

(b)   A small elevator of mass 600kg hangs from a steel cable 5m long. The wires making up the cable have a total cross-section area of 0.5cm^2, and with this load cable stretches to 5.4m long.

Calculate:

(i)   Stress of the steel cable.

(5 marks)

(ii)   Strain of the steel cable.

(5 marks)

(iii)   Young's Modulus for the steel in cable.

(5 marks)

Q3   (a)   A railway track is built in the summer when the temperature is 34^0C. At the time of construction its length is 70m ($\alpha_{steel} = 1.25 \times 10^{-4}$C^{-1}).

Calculate the length of the railway track on a cold winter day when the temperature is 9^0C.

(5 marks)

(b)   Discuss the direction of heat flow when two objects at different temperatures are placed in thermal contact.

(8 marks)

(c)   Figure **Q3(c)** shows bimetallic strip, brass and iron in room temperature, 26^0C. They have 800mm long. Given linear expansion, $\alpha_{iron} = 12 \times 10^{-6}$C^{-1} and $\alpha_{brass} = 19 \times 10^{-6}$C^{-1}.

Calculate:

(i)   Calculate the final length if the iron and brass heated to 52^0C.

(6 marks)

(ii)   Calculate the changes in length if they had been cooled to 15^0C.

(4 marks)

(iii)   Explain with sketches if the bimetallic strip in Figure **Q3(c)** is heated and cooled.

(2 marks)

Q4   (a)   An ultrasonic tranducer, used for medical diagnosis oscillating at a frequency of 5.9MH$_z$.

Calculate time(T) and angular frequency(ω) of each oscillation.

(5 marks)

(b)   Wave is characterised as some sort of disturbance that travels away from its source.

    (i)   Describe the progressive wave.

                                 (3 marks)

    (ii)   Explain the differences between transverse wave and longitudinal wave.

                                 (5 marks)

(c)   A captain notices that his ship is moving up and down periodically owing to wave on the surface of the water. It takes 4s for ship to travel from its highest point to its lowest, a total distance of 9m. The captain sees that the wave crests are spaced 9m apart.

Calculate :

    (i)   the period of the wave.

                                 (2 marks)

    (ii)   the frequency of the wave.

                                 (3 marks)

    (iii)   the speed of waves travelling.

                                 (3 marks)

    (iv)   the amplitude of each wave.

                                 (2 marks)

    (v)   angular frequency of the wave

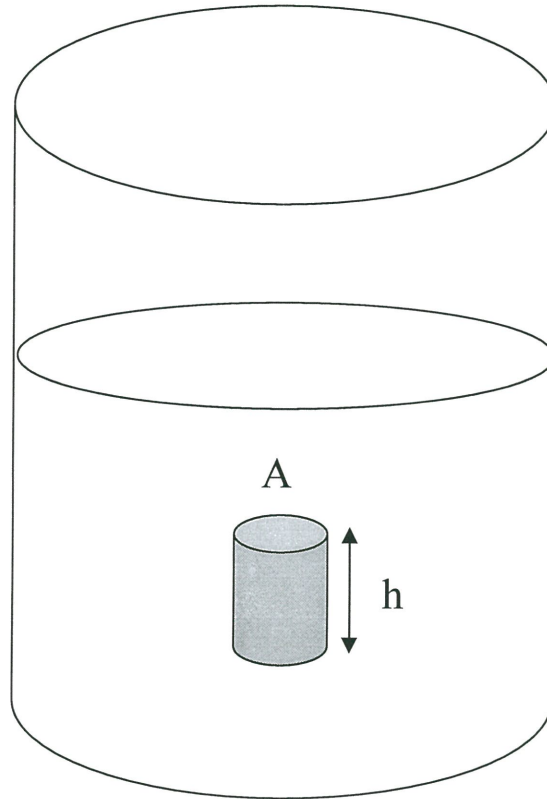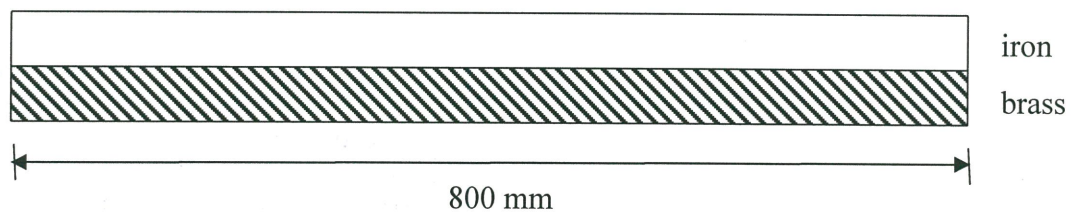   (2 marks)

- END OF QUESTIONS -

FIGURE Q1(b) : A Glass of Beaker

FIGURE Q3(c) : Bimetallic Strip

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