Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	PHYSICS FOR CIVIL ENGINEERING
COURSE CODE	:	DAC 12102
PROGRAMME CODE	:	DAA
EXAMINATION DATE	:	JULY / AUGUST 2023
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	1. ANSWER **FOUR (4)** QUESTIONS ONLY
		2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.**
		3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

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Q1 (a) A liquid is measured by mass 36 gram and volume 3 mL.

(i) Define density and Specific Gravity

(2 Marks)

(ii) Calculate the density of the liquid.

(2 Marks)

(iii) Find specific gravity if the liquid if water used to has density 1 g/mL

(3 Marks)

(iv) Explain is the liquid stay at bottom or float when mixed with water.

(1 Mark)

(b) A box with height H=6 cm and density 800 kg/m^3 is released in fluid with density 1200 kg/m^3 then suddenly partially float as shown in **Figure Q1(b).**

(i) Draw Free Body Diagram (FBD) of forces acting on the box

(2 Marks)

(ii) Calculate height of submerged part, h.

(6 Marks)

(iii) If a person push the block until reaching bottom of fluid then he released it back, determine the acceleration of the box.

(5 Marks)

(c) A container is closely air tight with lid of surface area 77 m^2. If strong force up to 480 N required to open the lid at normal atmospheric pressure 1.0 x 10^5 Pa, determine the internal air pressure inside the container.

(4 Marks)

Q2 (a) Define heat transfer by convection.

(1 Mark)

(b) The phase change of a material from liquid to solid is given by graph in **Figure Q2(b)**. Given the mass of the material is 0.400 kg, t_s=80 min, and specific heat of material at liquid phase is 3000 J/kg.K. Calculate:

(i) Heat required to be removed from body to reach freezing point.

(4 Marks)

(ii) Heat transfer rate.

(3 Marks)

(iii) Latent heat of fusion of the material.

(4 Marks)

(iv) Specific heat capacity of material in solid phase.

(5 marks)

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(c) Steam at 100°C mixed with 150 g of ice at its melting point, in a thermally insulated container, then produce liquid water. (Given L_f=79.7 cal/g , c_{water}=1 cal/g.°C, and L_v=539 cal/g)

(i) Define the concept of Thermal equilibrium.

(2 Marks)

(ii) Calculate mass of steam required to produce water at 50°C.

(6 Marks)

Q3 (a) Write the definition of:

(i) Amplitude.

(ii) Frequency.

(iii) Antinode.

(3 Marks)

(b) A string has linear density μ= 525 g/m and is under tension τ = 45 N. A sinusoidal wave with frequency f = 120 Hz and amplitude y_{max} = 8.5 mm generated along the string

(i) Find angular frequency of the wave.

(2 Marks)

(ii) Determine speed of wave.

(3 Marks)

(iii) If identical wave come from opposite direction and superimposed with wave produced, determine final amplitude, and write the new equation.

(5 Marks)

(c) **Figure Q3 (c)** shows shows a pattern of resonant oscillation of a string of mass m=2.500 g and length L = 0.800 m and that is under tension τ= 325.0 N

(i) Write the number of modes.

(1 Mark)

(ii) Determine wavelength of the standing wave.

(2 Marks)

(iii) Calculate velocity of the wave.

(3 Marks)

(iv) Calculate frequency of the wave.

(3 Marks)

(v) If then same rope used to produce fundamental mode, determine the frequency.

(3 Marks)

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Q4 (a) Write the function of displacement and pressure for sound wave travel from right to left direction.

(2 marks)

(b) Plot the displacement and pressure graph of the sound wave accordingly.

(4 marks)

(c) Two spectators sit at a baseball game, and a moment later hear, the ball being hit on the playing field. The time delay for spectator A is 0.23 s, and for spectator B it is 0.12 s. Those two spectators sit at right angle 90° with the player that hit the ball. Calculate:

(i) How far is spectator A and B from the player? (4 Marks)

(ii) How far are the spectators from each other? (4 Marks)

(d) Suppose a train that has a 150 Hz horn is moving at 35.0 m/s in still air on a day when the speed of sound is 340 m/s. Calculate:

(i) The frequencies observed by a stationary person at the side of the tracks as the train approaches.

(4 marks)

(ii) The frequency as observed by the train's engineer traveling on the train.

(4 marks)

(e) An electric motor from vacuum cleaner produce intensity of sound rated at 100,000 than intensity of threshold I_0. Calculate the intensity in decibel unit.

(3 Marks)

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Q5 (a) A monochromatic laser with wavelength 633 nm passes through a narrow single-slit. It was observed that the diffraction pattern is formed on a screen. If the screen is 6 m from the slit and the width of the screen of the central bright is 64 mm, determine

(i) the width of the slit.

(4 marks)

(ii) the distance between the central bright fringe and the third minima fringe.

(3 marks)

(b) Define Coherent source.

(2 marks)

(c) Two narrow slits are 0.05 mm apart. Monochromatic light of wavelength 450 nm is used to illuminate the slits. A fringe pattern is formed on a screen 4 m away.

(i) Calculate the distance between adjacent fringes.

(3 marks)

(ii) Calculate the distance between the third bright fringes formed on a screen.

(5 marks)

(iii) If one of the slits is covered, sketch a graph of the intensity of light of the fringe pattern versus its position.

(3 marks)

(iv) Name the phenomenon that occured in **Q5(c)(i)** and **Q5(c)(ii)** but does not occur in **Q5(c)(iii).**

(1 mark)

(d) A man is standing 0.50 m from a concave mirror. If his image is upright and magnified by a factor of 3, calculate:

(i) the distance of the image formed.

(2 marks)

(ii) the radius of curvature for the mirror.

(2 Marks)

-END OF QUESTIONS –

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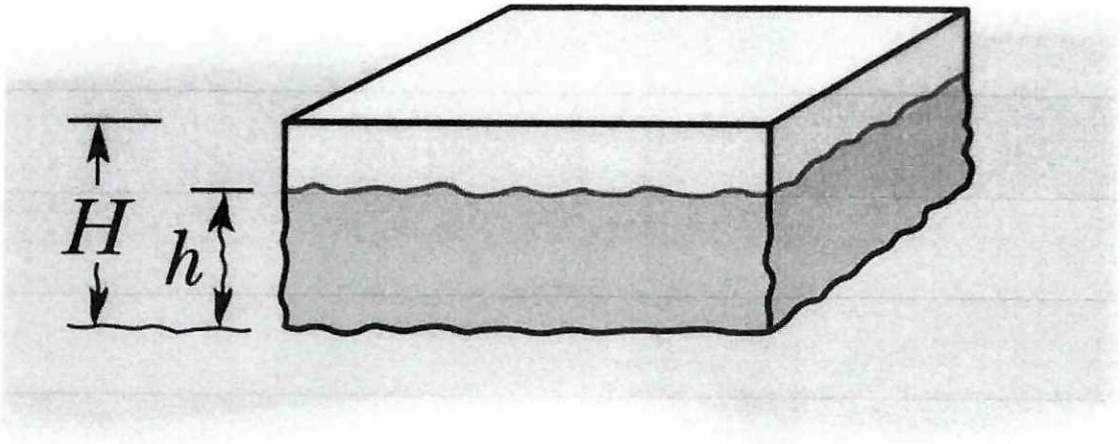

Figure (Q1)(a)

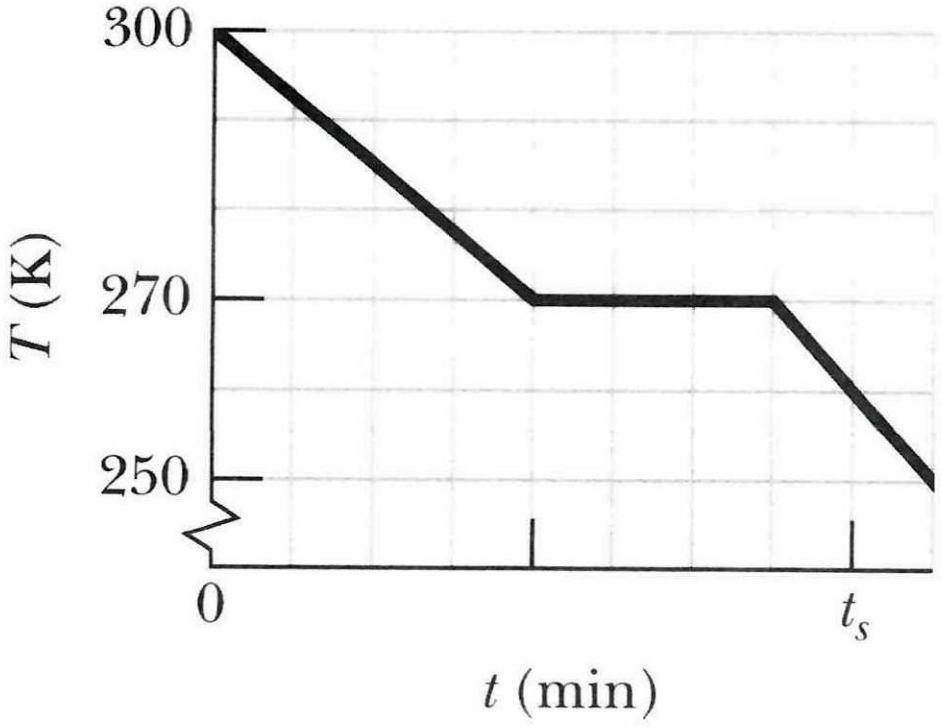

Figure Q2 (b)

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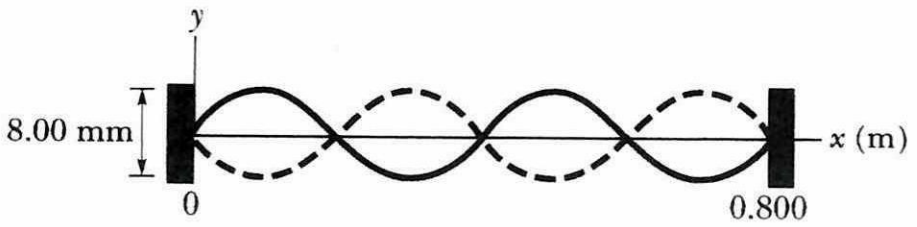

Figure Q3(c)

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LIST OF FORMULA

$T_K = T_C + 273.15$

$a_c = \frac{v^2}{r}$

$T_C = \frac{T_F - 32}{1.8}$

$\vec{p} = m\vec{v}$

$K = \frac{1}{2} mv^2$

$\Delta E = W = F_{\parallel} = Fd\cos\theta$

$\omega = \omega_0 + \alpha t$

$U_s = \frac{1}{2} kx^2 \sqrt{\frac{r}{\rho}}$

$F_b = \rho g V$

$\rho = \frac{m}{V}$

$n_1 \sin\theta_1 = n_2 \sin\theta_2$

$Q = mc\Delta\theta$

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