UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	PHYSICS II
COURSE CODE	:	DAS 14203/DSF1973
PROGRAMME	:	2 DAA / 2 DAE / 2 DAM / 3 DTT / 3 DAA / 3DET
EXAMINATION DATE	:	OCTOBER 2012
DURATION	:	2½ HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS IN **PART A** AND **TWO (2)** QUESTIONS ONLY IN **PART B**

THIS QUESTION PAPER CONSISTS OF NINE (9) PAGES

PART A

Q1 (a) Two slits are separated by 2.00×10^{-5} m. They are illuminated by light of wavelength 5.60×10^{-7} m. If the distance from the slits to the screen is 6.00 m, what is the separation between the central bright fringe and the third dark fringe?

(5 marks)

(b) In a Young's double slit experiment, the separation between the slits is 1.20×10^{-4} m; and the screen is located 3.50 m from the slits. The distance between the central bright fringe and the second-order bright fringe is 0.0415 m. What is the wavelength of the light used in this experiment?

(5 marks)

(c) Light of wavelength 600 nm is incident upon a single slit with width 4×10^{-4} m. The **Figure Q1(c)** shows the pattern observed on a screen positioned 2 m from the slits. Determine:

(i) the distance *s*.
(ii) the distance *d*.
(iii) the width of central maximum.

(15 marks)

Q2 (a) By sketching a simple diagram, states the law of reflection on a plane mirror.

(6 marks)

(b) An object 8 cm high is placed 60 cm from a concave mirror of 10 cm focal length. Find the distance, size and character of image.

(9 marks)

(c) An object is 25 cm in front of a convex mirror with a focal length of 12cm. Find the image distance and the magnification of the image.

(5 marks)

(d) At what angle must a ray of light incident on water to be refracted into the water at an angle of 30° to the normal?

(5 marks)

PART B

Q3 (a) A car is moving at a speed of 20m/s. The driver of the car sounds a horn having a frequency of 800Hz. What is the frequency in the sound that the observer hears if the car moving away from stationary observer?

(3 marks)

(b) As shown in **Figure Q3(b)**, an observer is standing between two parallel roads when two cars approach from opposite directions. Car A has speed v_a=20m/s and the driver sound a horn, which has a frequency 150Hz. Car B has a speed v_b=15m/s.

(i) Find the wavelength λ and frequency receives from car A.

(ii) What frequency heard by the driver on car B?

(11 marks)

(c) Refer to question Q3(b), if some of the sound waves reaching car B are reflected back toward observer and car A.

(i) Find the wavelength and the frequency of the reflected sound waves that observer hears.

(ii) What frequency does the driver on car A hear in the reflected waves?

(11 marks)

Q4 (a) Define

(i) Pascal's Law

(ii) Archimedes Principle

(4 marks)

(b) A 120kg solid cube of materials with density of $6.5 \times 10^3 kg/m^3$ is immersed in oil. The density of oil is $800kg/m^3$.

(i) Calculate the volume of solid cube.

(ii) How much the weight of oil displaced by the solid cube?

(iii) Compute the force is required to support the solid cube when it is immersed in oil?

(12 marks)

(c) A hydraulic lift has a large piston 40cm in diameter and a small piston 5cm in diameter.

(i) What force is required on small piston to lift a load of 1200 kg?

(ii) What is the pressure increase due to the force in the confined fluid?

(9 marks)

Q5 (a) Suzana decides to create her own temperature scale. She places an uncalibrated mercury thermometer into an ice-water bath and calls the mercury level 20.0°S. She then places the uncalibrated thermometer into boiling water and calls the mercury level 170.0°S. Finally, she divides the distance between these two levels into 150 equal lengths. Determine the following:

(i) The reading on Suzana's thermometer when a Fahrenheit thermometer reads 80.0°F.

(ii) The Kelvin temperature when Suzana's thermometer reads 125°S.

(10 marks)

(b) In a calorimetry experiment, 200 g of water is placed in a 150 g copper calorimeter cup. The cup and water have an initial temperature of 20°C and are well insulated from the surroundings. After 200 g of lead shot is heated to 100°C it is dumped into the water and an equilibrium temperature obtained. Determine the following:

(i) Final equilibrium temperature of the system

(ii) Heat gained by the water

(iii) Heat gained by the calorimeter cup

(iv) Total Heat gained by the water and calorimeter cup

(v) Total Heat lost by the lead shot

(15 marks)

Q6 (a) A steel cable 4.00 m long is stretched tightly across a driveway on a day when the temperature is 30.0°C. The coefficient of linear expansion for steel is 1.20×10^{-5}/K and Young's Modulus for steel is 2.00×10^{11} N/m^2. Calculate the change in length of the steel cable on a day when the temperature is -10.0°C.

(5 marks)

(b) A 150-cm^3 glass test tube is filled to the brim with water at 0°C. Determine the amount of water that will overflow if the test tube and contents are heated to 100°C. Given, $\gamma_{water} = 207 \times 10^{-6} K^{-1}$ *and* $\gamma_{glass} = 26 \times 10^{-6} K^{-1}$.

(5 marks)

(c) Determine the change in volume of a block of iron 5 cm × 10 cm × 6 cm, when temperature changes from 15°C to 47°C. $\alpha_{iron} = 12 \times 10^{-6}\ °C^{-1}$.

(5 marks)

(d) One wall of a house consists of plywood backed by insulation as shown in **Figure Q6(d)**. The thermal conductivities of the insulation and plywood are 0.030 and 0.080 J/(s·m·°C), respectively, and the area of the wall is 35m^2. Find the amount of heat conducted through the wall in one hour.

(10 marks)

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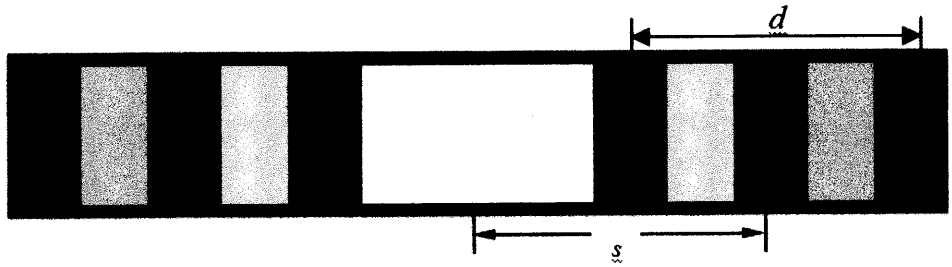

FIGURE Q1(c)

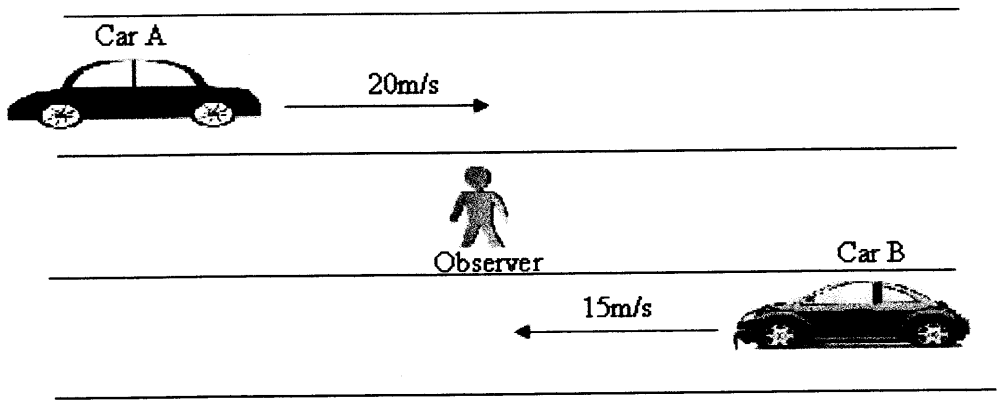

FIGURE Q3 (b)

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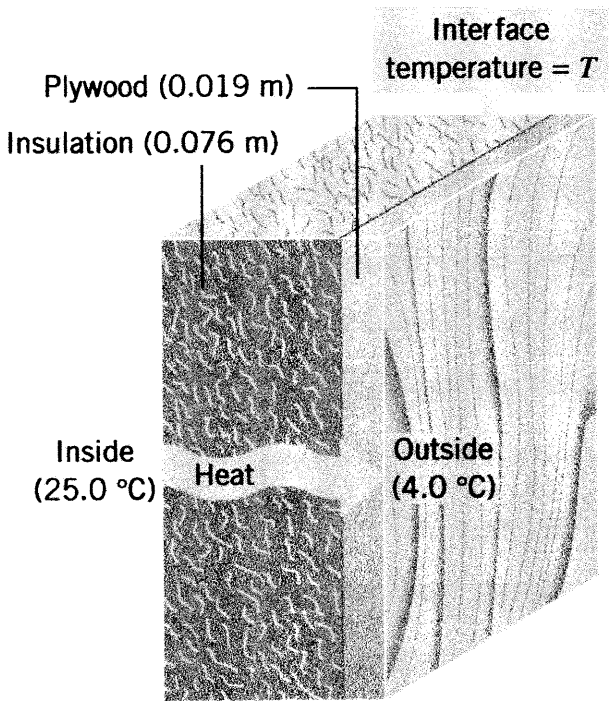

Figure Q6(d)

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LIST OF CONSTANTS

1. Gravity acceleration, $g = 9.81$ m/s^2
2. Speed of light in air, $c = 3 \times 10^8$ m/s
3. Speed of sound, $v_{sound} = 335$ m/s
4. Threshold of sound intensity, $I_o = 1 \times 10^{-12}$ W/m^2
5. Atmospheric pressure, $P_{atm} = 1.0 \times 10^5$ Pa
6. Specific heat of water, $c_{water} = 4.186$ kJkg^{-1}K^{-1}
7. Specific heat of copper, $c_{copper} = 0.385$ kJkg^{-1}K^{-1}
8. Specific heat of lead, $c_{lead} = 0.13$ kJkg^{-1}K^{-1}
8. Latent heat of fusion of water, $L_f = 333.7 \times 10^3$ J/kg
10. Latent heat of vaporization of water, $L_v = 2256 \times 10^3$ J/kg
11. Density of seawater, $\rho_{seawater} = 1030$ kg/m^3
12. Density of water, $\rho_{water} = 1000$ kg/m^3
13. Refractive index (n_{air}) of air = 1.00
14. Refractive index (n_{water}) of water = 1.333
15. Refractive index (n_{ice}) of ice = 1.304

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LIST OF FORMULAS

$y = \frac{(m+\frac{1}{2})\lambda D}{d}$	$Sin\theta = \frac{m\lambda}{d}$	$y = \frac{m\lambda L}{d}$
$T_F = 1.8T_C + 32^o F$	$\Delta L = \alpha L_o \Delta T$	$\Delta A = \beta A_o \Delta T$
$Q = mc\Delta T$	$Q = mL_f$	$Q = mL_v$
$\Delta V = \gamma V_o \Delta\theta$	$\gamma = \gamma_{apparent} + \gamma_{glass}$	$\frac{Q}{t} = \frac{\Delta T}{\sum R_n}$
$\frac{Q}{t} = \kappa A \frac{\Delta T}{d}$	$\Delta P = \frac{F_1}{A_1} = \frac{F_2}{A_2}$	$F = \rho g V$
$P = \frac{F}{A} = \rho g h$	$F_{net} = W - F_B$	$\frac{Q}{t} = kA(\frac{T_{hot} - T_{cold}}{d})$
$\rho = \frac{m}{V}$	$W = mg$	$\lambda = \frac{v}{f}$
$\beta = 10\log\left(\frac{I}{I_o}\right)$	$A_{circle} = \pi r^2$	$A_{sphere} = 4\pi r^2$
$V_{sphere} = \frac{4}{3}\pi r^3$	$f_o = f_s \frac{(v \pm v_o)}{(v \mp v_s)}$	$n_1 \sin\theta_1 = n_2 \sin\theta_2$
$m = \frac{h_i}{h_o} = -\frac{d_i}{d_o}$	$T = (\frac{X_T - X_o}{X_{100} - X_o})x100^o C$	$I = I_0 \cos^2\theta$
$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$		