فيزياء أول قوى ميكانيكية ١/١/٢٠١٤

Menofia University Faculty of Engineering, Shebin El-Kom Basic Engineering Science Department First Semester Examination,2013-2014 Date of Exam: 1 / 1 / 2014	جامعة المنوفية	Subject: PHYSICS Code: BES116 Year: First Year Mechanical Power Eng. Time Allowed : 3 hours Total Marks : 90 marks

Answer the following questions.

Question 1 (18 marks)

a. (i) At what displacement of SHO is the energy half kinetic and half potential energy.
(ii) What is the fraction of the total energy of SHO is kinetic and what fraction potential when the displacement is half the amplitude. *(6 marks)*

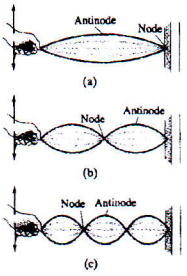
b. An object oscillates with simple harmonic motion along the x axis. Its position varies with time according to the equation

$$x = (3.00\ m)\cos\left(\pi t - \frac{\pi}{2}\right)$$

where t is in seconds and the angles in the parentheses are in radians.

i. Determine the amplitude, frequency, and period of the motion.
ii. Calculate the velocity and acceleration of the object at any time t.
iii. Using the results of part (b), determine the position, velocity, and acceleration of the object at t = 1sec.
iv. Determine the maximum speed and maximum acceleration of the object.
v. Find the displacement of the object between t = 0 and 1sec. *(6 marks)*

c. In the corresponding figure, the length of string (L) is 3m.
Find the frequency of wave in each case a,b and c.
Note the velocity of wave is constant for all cases and equal to 300 m/s. (6 marks)



Question 2 (18 marks)

a. Show the mathematical representation of damped electrical oscillation (LRC Circuit) with distinguishing between the possible three cases (over-damped, critically damped and under-damped). *(6 marks)*

b. A 750 g block oscillates on the end of a spring whose force constant is k = 56.0 N/m. The mass moves in a fluid which offers a resistance force F = -bv, where b = 0.162N.s/m. (a) What is the period of the motion, (b) What is the fractional decrease in amplitude per cycle and (c) Write the displacement as a function of time if t = 0, x = 0, and at t = 1.00 s, x = 0.120 m. *(6 marks)*

c. i) Drive the expression of velocity for transverse wave traveling through a certain cord under tension. ii) Is the velocity of wave increased, if you use denser cord? *(6 marks)*

Question 3 (18 marks)

a. i) what is the physical meaning of beating phenomenon?
ii) Drive the expression of the beat frequency. *(6 marks)*

The intensity of a particular earthquake wave is measured to be 2.2×10^6 W/m^2 at a distance of 100Km from the source. (a) What was the intensity when it passed a point only 4.0Km from the source? (b) What was the total power passing through an area of 5.0m^2 at a distance of 4.0Km? *(6 marks)*

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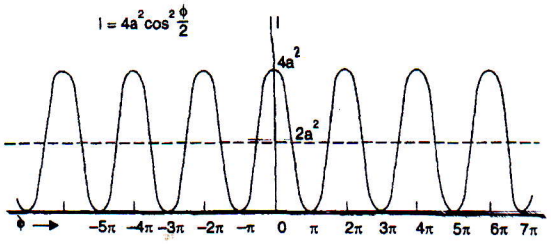
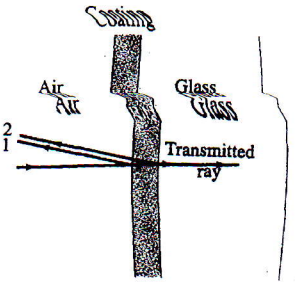
c. True or false with explain: *(6 marks)*

i) The following figure shows the intensity distribution for the interference fringes from two waves of same frequency and amplitude.



ii) The corresponding figure represented a glass lens with refractive index (n_1 = 1.5) coated with thin film of transparent material refractive index (n_2 = 1.45). The required minimum thickness of thin film to reduce reflected light is $t = \frac{\lambda}{2n_2}$, where λ is the wavelength of light.



iii) In case of single slit diffraction, the width of central maximum equal to the width of subsidiary maximum.

Question 4

(18 marks)

a. In air wedge interference, prove that the distances between fringes are equally spaced. *(6 marks)*

b. A bat at rest sends out ultrasonic sound waves at 50KHz and receives the then returned from an object moving away from it at 25m/s. What is the received sound frequency? (speed of sound in air is 343m/s) *(6 marks)*

c. A screen is placed 50.0 cm from a single slit, which is illuminated with 690 nm light. If the distance between the first and third minima in the diffraction pattern is 3.00 mm, what is the width of the slit? *(6 marks)*

Question 5

(18 marks)

a. what is the difference between the phenomenon of interference and diffraction. *(6 marks)*

b. In Young's double slit experiment, the distance between the slits is 1 mm. The distance between the slit and the screen is 1 meter. The wavelength used in 5893 Å. Compare the intensity at a point distance 1 mm from the centre to that at its centre. Also find the minimum distance from the centre of a point where the inter y is half of that at the centre. *(6 marks)*

c. How you can determine the wavelength of light source using Newton's rings experiment? *(6 marks)*

With our Best Wishes

This exam measures the following ILOs															
Question Number	Q1-b	Q1-c	Q2-a	Q3-b	Q4-a	Q5-a	Q1-a	Q2-b	Q2-c	Q3-a	Q3-c	Q4-b	Q4-c	Q5-b	Q5-c
Skills	a1-1	a1-2	a1-1	a1-2	a1-3	a1-3	b3-1	b3-1	b2-1	b2-1	b3-2	b3-2	c1-3	C1-1	c1-3
	Knowledge &Understanding Skills						Intellectual Skills						Professional Skills		