Kingdom of Saudi Arabia
Ministry of Education
Umm Al-Qura University
College of Applied Sciences
Physics Department

Semester: 1st semester 1439-1440
Exam: 1st Class Test Exam
Program: Medical Physics
Course: Physics of Medical Ultrasound.
Course Code: 403390-2
Time: 1 Hr
Date: 7-2-1440
Total Marks: 15 Mark

Student's Name: **Student ID:** **Group No.:**

Please answer three questions only: **اجب عن ثلاثة اسئلة فقط مما يلى**

[Question One] *[5 Marks]*

Complete each sentence of the followings:

1) A wave is a type of …….. and waves transfer …….. not ……...

2) A wave is any …….. from an equilibrium condition that …….. (or ……..) with time from one region of space to another.

3) The …….. waves below are carrying …….. but are not ……...

4) The waves that require an elastic medium to propagate through are called……..

5) …….. waves travel through a medium. A medium is a kind of matter like ……., ……., or ……...

6) In a …….. wave, the matter molecules moves back and forth …….. to the direction of the wave.

7) In sound waves, the energy moves in the …….. direction as the wave.

8) The displacement of the wave at any time and position can be represented by equation ……..

9) If the sinusoidal wave is propagated through a string which has a *mass per unit length (μ)* and is under a *tension (F)*, then the wave speed is given by……..

10) The longitudinal waves contain areas of refraction, where the particles are spread with …….. …..pressure and area of …… …….. …. Where, particles are close together with …….. …….pressure.

[Question Two] *[5 Marks]*

Write an equation describing a sinusoidal transverse wave traveling on a cord in the + x direction with a wavelength of 10 cm, a frequency of 400 Hz, and an amplitude of 2.0 cm?

[Question Three] *[5 Marks]*

A certain string has a linear mass density of 0.25 Kg/m and is stretched with a tension *of 25* N. One end is given a sinusoidal motion with frequency 5 Hz and amplitude 0.01 m. At time t= 0 the end has a zero displacement and is moving in the +*x* direction, Find:

1-The wave speed, amplitude, angular velocity, periodic time, wavelength, wave number?

2-Write a wave function describing the wave?

3-Find the displacement-at *x* = 0.5 m at time *t =0.01 s?*

[Question Four] *[5 Marks]*

Deduce a harmonic wave function that expressed by wave number (K) and the angular frequency (w), Knowing that that the wave function is given by

$$y(x,t) = A\sin\left(2\pi\left[\frac{x}{\lambda} - \frac{t}{T}\right]\right) \quad ?$$

[Question Five] *[5 Marks]*

Define the Ultrasound wave intensity and discuss the physical parameters depending on?

With best wishes