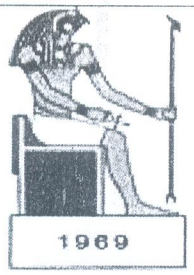


Tanta University
Faculty of Science
Physics Department

Examination for Biophysics and Physics Students

COURSE TITLE:	**Acoustics**	**COURSE CODE:**	**PH 2141**
January 9th, 2014	**TERM: FIRST**	**TOTAL ASSESSMENT MARKS:100**	**TIME ALLOWED: 2 HOURS**

QUESTION	*ANSWER THE FOLLOWING QUESTIONS:*	*Marks*
1.	a- Attenuation process of ultrasonic takes place in solids, Write about attenuation process and explain the main sources of losses and absorption processes. b- Discuss the different types of the mechanical waves, and explain the parameters that control the speed of sound in different media for each type.	25
2.	a- Explain in details the following phenomena: 1- Piezoelectric effect, 2- Doppler effect. b- Discuss in details the different types of transducers.	25
3.	a- A submarine (sub A) travels through water at a speed of 8.00 m/s, emitting a sonar wave at a frequency of 1 400 Hz. The speed of sound in the water is 1 533 m/s. A second submarine (sub B) is located such that both submarines are traveling directly toward one another. The second submarine is moving at 9.00 m/s. 1- What frequency is detected by an observer riding on sub B as the subs approach each other? 2- The subs barely miss each other and pass. What frequency is detected by an observer riding on sub B as the subs recede from each other? b- Medical imaging using the ultrasound is very important application in medicine; explain in details one mode of medical imaging.	25
4.	a- A standing wave is generated if two waves superposed upon another of the same frequency traveling in different directions, Explain and derive the conditions for nodes and antinodes creation. b- Scattering process of ultrasonic is of great important, explain why and define the different scattering regions and scattering parameters.	25
EXAMINER	Dr. Hassan El Gohary	

Tanta University Faculty of Science Department of Physics	Final First Term Examination Academic year 2013/2014 Mathematical Physics Course (1)	Course Code: PH 2161 Physics Date: 2/1/2014 Time allowed: 2 hours	

Solve the Following Questions:

First Question:

(a)Find the differential equation of the equation

$$y = a \ln bx$$

where a & b are arbitrary constants.

(b) According to Newton's law of cooling, which states that "The rate of heat loss of a body is proportional to the difference in temperatures between the body and its surroundings". If the temperature of the surroundings is 30^o and the temperature of the body decrease from 100^o to 70^o in 15 minutes. After what time the body temperature would be 40^o.

Second Question:

(a) Make sure that the next differential equation is homogeneous, then find its general solution

$$x\frac{dy}{dx} = (y - x\cos^2\frac{y}{x})$$

(b) Find the inverse of the matrix

$$A = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$$

Third Question:

(a) Solve the exact differential equation

$$2x\sin(3y)dx + 3x^2\cos(3y)dy = o$$

(b) Find the values of x which satisfies the equation:

$$\begin{vmatrix} x^2 & x & 1 \\ 4 & 2 & 1 \\ 9 & -3 & 1 \end{vmatrix} = 0$$

Fourth Question:

(a) Find the solution of the differential equation

$$x\frac{dy}{dx} + y = xy^3$$

(b) By variable separation, solve the following differential equation

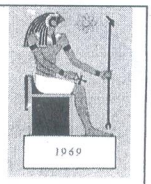
$$\cos x \cos y dx + \sin x \sin y dy = 0$$

(c) If the matrisies

$$A = \begin{bmatrix} -1 & 3 & 1 \\ -2 & 2 & 4 \end{bmatrix} \quad , \quad B = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix} \quad , \quad C = \begin{bmatrix} 2 \\ -3 \end{bmatrix}$$

Find AA^T, BC, B^TC

With my best wishes.

Tanta University Faculty of Science Department of Physics	Final First Term Examination Academic year 2013/2014 Electromagnetic Theory (1) Course	Course Code: PH 2151 Physics Date: 5/1/2014 Time allowed: 2 hours	

Solve the Following Questions:

First Question:

(a) IF

$$A = 2xz \qquad \overline{F} = yz\hat{i} + xy\hat{j}$$

Find : (a) $Curl(A\overline{F})$ **(b)** $\overline{F} \wedge gradA$ **(c)** $\nabla^2 \overline{F}$

(b) Two charges in space, $q_1 = 4mc$ **at coordinates (2,3,4) cm and** $q_2 = -2\mu c$ **at the origin.**
Find : (i) The force vector between the two charges.
(ii) The net potential at the point (1,1,4) cm.

Second Question:

(a) Find the flux of the electric field

$$\overline{E} = -\hat{i} + 2\hat{j} - 2\hat{k} \qquad N/C$$

through a rectangle of dimensions 4 cm and 2 cm in the YZ plane.
(b) Find the electric field at a point P at a distance Z from a disc, of radius R and of surface charge density σ, along its central axis.

Third Question:

(a) Two points of coordinates $P_1(5\,cm, 30^o, 3\,cm)$ *and* $P_2(10\,cm, 45^o, 60^o)$**. Find the value of the position vectors corresponding to both points in Cartesian coordinates.**

(b) A sphere of radius R made from insulated material and contains a positive charge of volume density ρ distributed uniformally. Using Gauss's theorem to find the electric field at any point : (a) inside the sphere, (b) outside the sphere, (c) directly on the surface of the sphere. Draw a diagram shows the changes in the electric field in the three states.

Fourth Question:

(a) Deduce the relation between the Cartesian coordinates and both the cylindrical and spherical coordinates in space.

(b) A vector Ā of value equal 2 units and make an angle of 30° with the positive direction of the X-axis, and another one B̲ of value equal 6 units in the positive direction of the Y- direction. Find:

$$\left|\overline{A} \wedge \overline{B}\right| \qquad \textit{and} \qquad \overline{A}.\overline{B}$$

(c) The distance between two point charges q and -3q, is 1m. Find the point (or points) at which the potential is zero.

With my best wishes.