Menoufia University
Faculty of Engineering,Shebin El-Kom
Basic Engineering Science Department
Total Marks:90 marks
Answer the following questions:

Subject:فيزياء اولى مدني
Date of Exam: 27/5/2018
Time Allowed:3 hours

First question 15 Marks

a-If white light is used in Youngs double-slit experiment rather than monochromatic light,how does the interference patteren changes?

b-Are the kinetic and potential energies at a given point in the motion for an object spring affected by the change in mass? Explain .

c-When a 0.50-kg mass is attached to a vertical spring, the spring stretches by 15 cm .How much mass must be attached to the spring to result in a 0.75-s period of oscillation?

d- A 150-cm-long string resonates in its fundamental to a frequency of 120 Hz.(i)What is the speed of the wave on the string ? (ii) What frequency will cause it to vibrate in five segments?

Second question 15 Marks

a- Why are no electromagnetic waves (EM) generated a round a wire in which a steady current is flowing? And how can you obtain EM waves?

b-Define : 1-System obeying Hookes law . 2- Restoring force 3- Angular frequency 4-Sound intensity .

c-A 4.5-kg object oscillates on a horizontal spring with an amplitude of 3.8 cm. Its maximum acceleration is 26 m/s^2. Find (i) the force constant k, (ii) the frequency ,and (iii)the period of the motion.

d-A 3-kg object oscillates on a spring with an amplitude of 8 cm .Its maximum acceleration is 3.50 cm/s^2 .Find the total energy .

Third question 15 Marks

a- Write and explain the types of the waves? Names two examples of each kind?

b- An object moves with simple harmonic motion. If the period of motion is doubled, by what multiplicative factor do the following: (i) angular frequency (ii) maximum speed (iii) maximum acceleration.

c- A 0.4-kg block attached to a spring of force constant 12 N/m oscillates with an amplitude of 8 cm . Find (i) the maximum speed of the block ,(ii) the speed and acceleration of the block when it is at x =4 cm from the equilibrium position ,and (iii)the it takes the block to move from x-0 to x = 4 cm.

d- A 0.12-kg block is suspended from a spring .When a small stone of mass 30 g is placed on the block , the spring stretches an additional 5 cm .With the stone on the block ,the spring oscillates with an amplitude of 12 cm .(i) What is the frequency of the motion ? (ii) How long does the block tack to travel from its lowest point to its highest point?(iii) What is the net force of the stone when it is a point of maximum upward displacement?

Question four 15 Marks

a-What are the frequencies at the first and second overtones produced by an air column in case : (i) one end closed and one open .(ii) both end open .

b –What vibrates in the following types of waves : electromagnetic waves , waves on a string , sound waves , light waves , water waves ?

c – A train on one track moves in the same direction as a second train on the adjacent track. The first train , which is ahead of the second train and moves with a speed of 35.8 m/s , blows a horn whose frequency is 124 Hz .If the frequency heard on the second train is 133 Hz , what is its speed ?

d – In a certain Youngs double-slit experiment for which D = 1.00m and d = 0.10 cm ,the bright fringes are 0.050cm apart .What wavelength of light is being used ?

Question five 15 Marks

a- State the four assumptions of the Bohr theory which it applies to the Hydrogen atom ?

b- Explain with details (بالتفصيل) Compton effect and prove that

$\Delta\lambda = h/mc\ (1 - \cos\theta)$

c- A sodium surface is illuminated with light of wavelength 300nm. The work function for sodium metal is 2.46 eV. Find 1) the kinetic energy of the ejected photoelectrons .

2) the cutoff wavelength for sodium. { Planck constant=$6.626*10^{-34}$ J.S , light speed $3*10^{8}$ m/s}

d- The Paschen series for the hydrogen atom corresponds to electronic transitions that terminate in the state of quantum number n=? , if the Rydberg constant = $1.0973*10^{7}$ m^{-1} , Find the longest-wavelength photon emitted in this series and determine its energy? Also, find the shortest-wavelength photon?

Question six 15 Marks

a- Explain using draw the polarization by scattering?

b-20 gm from a substance optical activity put in 40 gm of water in the polarization tube . The density of the solution 2.2 gm/cm^3 and the length of tube is 20 cm . If the polarization plane rotate half angle from radian angles . Calculate the specific rotatory power for this matter?

c- Explain with details , Fraunhofer diffraction at a single – slit and state the general characteristics when θ is small? .

d-Monochromatic light from a helium-neon laser = 632.8 nm) is incident normally on a diffraction grating containing 6000 lines/inch . Find the angles at which one would observe the 1^{st} order maximum , the 2^{nd} order maximum , and so 4^{th}