



University of Technology
Department of Applied Sciences
final exam 2015/2016



Subject : modern physics
Branch : Laser
Examiner :Dr. Azhar Inad

Class : second year
Time : 3 hours
Date :

NOTE: ANSWER FOUR QUESTION ONLY

Q1-A/ Derive an expression show the relation between the de Broglie wavelength in angstrom and the acceleration voltage in volt for the electron. (7.5 mark)

B- the separation between the vibrational levels in CO molecule is (0.266 eV) , find:

- a) the wavelength of absorbed radiation to produce the transition between these levels
b) the force constant of CO bond. (mass of ^{12}C and ^{16}O atoms are respectively 1.99×10^{-26} kg and 2.66×10^{-26} kg, $h=6.6 \times 10^{-34}$ J.s). (10 mark)

Q2-A/ Prove that the velocity of an electron gives by relation ($v = \frac{e}{\sqrt{4\pi m \epsilon_0 r}}$) (7.5 mark)

B/ what is the minimum frequency present in the Balmer series of hydrogen atom. (10 mark)

Q3-A/ compare between a) nuclear fission and fusion b) weight and mass. (7.5 mark)

B/ Identical twins (A&B) they are 30 years old, each of them travel to a space in different space ships with velocities 0.9c and 0.6c respectively What is the difference in age between them after 10 years?

(10 mark)

Q4-A/ The work function of Sodium is about (2.28 eV) find: a) the threshold frequency of sodium.

- b) the maximum kinetic energy of the emitted electron when a photon with a frequency (1.1×10^{15})Hz incident. c) the maximum velocity of the emitted electron d) the cut-off voltage. (10 mark)

B/ an excited atom gives up its excess energy by emitting a photon , the average period that elapses between the excitation of an atom and the time it radiates is (10^{-8} sec). find the uncertainty in the frequency of the photon. (7.5 mark)

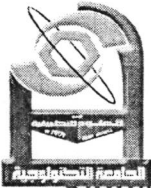
Q5-A/ A rocket length is (18 m) on the earth, and its length will reduced to be (16 m) when flying relative to observer on the earth. What is the velocity of the rocket? (7.5 mark)

B/ an x-ray photon of frequency (3×10^{19} Hz) collides with an electron and emitted back in the opposite direction of its falling find : a) the wavelength of the scattering photon

- b) the change in energy of the scattering electron. (10 mark)

GOOD LUCK

Note: ($h=6.6 \times 10^{-34}$ J.s, electron mass = 9.1×10^{-31} kg, $c=3 \times 10^8$ m/s $R= 1.097 \times 10^7$ m)



University of Technology
Department of Applied Sciences
First Semester Exam 2015/ 2016



Subject: Mathematics
Branch: Laser
Examiner: Amenah ali

Class: Second
Time: 3 hours
Date : /2016

Note : Answer four Questions only.

Q1: Write Fourier sine of the function $f(x) = e^{2x}$, $0 \leq x \leq 1$.

(17.5 mark)

Q2: Find the inverse of matrix:

$$A = \begin{pmatrix} 2 & 3 & -4 \\ 1 & 2 & 3 \\ 3 & -1 & -1 \end{pmatrix}$$

(17.5 mark)

Q3: Find the general solution of the differential equation:

$$y''' - y' = 4x^3 + 6x^2$$

(17.5 mark)

Q4/Solve the differential equation:

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

(17.5 mark)

Q5: Find: $\mathcal{L}^{-1} \left\{ \frac{1}{s^3 + 4s} \right\}$.

(17.5 mark)

GOOD LUCK