Dept. Elect. Eng.
1st Semester (فيزياء اولى كهرباء)
Academic year: 2017/2018
Date: 10/1/2018

Year: First
Time allowed 3 hours
Total Marked: 90 Marks

Faculty of Engineering

Answer the following questions:

First question (18 Marks)

i -Describe the polarization of white light by reflection.

ii-Why are no electromagnetic pulses or waves generated around a wire in which a steady direct current is flowing?

iii- A spring is hung from a ceiling, and an object attached to its lower end stretches the spring by a distance of 5.00 cm from unstretched position when the system is in equilibrium. If the spring constant is 47.5 N/m, determine the mass of the object.

iv- Transverse waves travel with a speed of 20.0 m/s in a string under a tension of 6.00N. What tension is required to produce a wave speed of 30.0 m/s in the same string.

Second question (18 Marks)

i- Make an energy-level diagram for hydrogen atom.

ii- How is a transverse wave different from longitudinal wave? Name two examples of each kind of wave.

iii- A spring stretches 3.9cm when a 10-g object is hung from it .The object is replaced with a block of mass 25 g that oscillates in simple harmonic motion. Calculate the period of motion.

iv- A 0.40-kg object connected to a light spring with a force constant of 19.6 N/m oscillates on a frictionless horizontal surface .If the spring is compressed 4.00 cm and released from rest ,determine (a)the maximum speed of the object,(b)the speed of the object when the spring is compressed 1.5 cm ,and (c) the speed of the object when the spring is stretched 1.5 cm,(d)For what value of x does the speed equal one-half the maximum speed?

Third question (18 Marks)

i- Why do Si^{14} and Ge^{32} have similar electronic properties ?

ii- Explain why the kinetic and potential energies of an object –spring system can never be neglected?

iii-A 326 g object ia attached to a spring and executes simple harmonic motion with a period of 0.250 s. If the total energy of the system is 5.83 J. ,find (a) the maximum speed of the object , (b) the force constant of the spring , and (c) the amplitude of the motion.

iv- A laser beam is incident on two slits with a separation of 0.200 mm and a screen is placed 5.00 m from the slits. If the bright interference fringes on the screen are separated by 1.58 cm, what is the wavelength of the laser light?

Forth question (18 Marks)

i- Describe the doping method to obtain n-type extrinsic semiconductor .

ii- What is the difference between ground state and excited states.

iii- An object of mass 2.00kg is oscillating freely on a vertical spring with a period of 0.600 s .Another object of unknown mass on the same spring oscillates with a period of 1.05 s. Find (a) the spring constant k and (b) the unknown mass.

iv- A single slit diffracts laser light of wavelength 635 nm onto a screen 2.5 m away .   The distance between the first-order maximum on either side of the central peak is 6.0 mm. How wide is the slit .

Fifth question (18 Marks)

i –Define: (a) Sound wave   (b) Wave front   (c) decibel scale (d) periodic motion   (e) energy gap .

ii- Describe Young Double slits experiment and write the condition of constructive interference ?

iii- Two trains on separate tracks move toward each other. Train 1 has a speed of 130 km/h , train 2 a speed of 90.0 km/h . Train 2 blows its horn ,emitting a frequency of 500 Hz .What is the frequency heard by the engineer on train 1 ?(Velocity of sound in air 331 m/s)

iv- If the threshold wavelength of a surface is 350 nm. Determine: (a) the photoelectric work function and (b) the maximum kinetic energy of the ejected photoelectrons when the surface is irradiated with monochromatic light of wavelength 250 nm.