Govt. Mahila Engineering College, Ajmer

I Mid Term Examination-2017-18 {I-BTech (I Semester)} Section B [CSE]

Subject: - Engineering Physics

Time: - 60 Min

MM: - 20

1. Attempt all the questions. (2×6 = 12)

a) With Schematic explain how energy bands are formed in Solids?

b) Michelson interferometer experiment is performed with a source which consists of two wavelengths 4882 Å and 4886 Å. Through what distance does the mirror have to be moved between two positions of disappearance of fringes.

c) Show that visibility is a measure of coherence.

d) A glass microscope lens (μ= 1.5) is coated with magnesium fluoride (μ=1.38) film to increase the transmission of normally incident light $\lambda = 5000\text{Å}$. What minimum film thickness should be deposited on the lens?

e) Write a short not on Interference Filter.

f) White light has a frequency range from $0.4\text{x}10^{15}$ Hz to $0.7\text{x}10^{15}$ Hz. Find the coherence time and coherence length for it.

2. Obtain an expression for shift in wavelength of the scattered photon by Compton scattering? Also give reason why the Compton shift is detectable only in X-rays region and not in visible range of light? **(5)**

OR

With schematic diagram, example the working of a Michelson interferometer. Obtain the expression for radii of circular interference fringes. How shall you use to measure wavelength separation between two closed spaced spectral lines say D_1 and D_2 lives of sodium lamp? **(5)**

3. Drive an expression for the maximum acceptance angle and numerical aperture of an optical fiber in terms of fractional refractive index change (Δ) . **(3)**

OR

Explain Hall Effect. Drive an expression for the Hall Coefficient. Also mention its two application. **(3)**

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II Mid Term Examination-2017-18 {I-BTech (I Semester)} Section B [CSE]

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4. Obtain an expression for shift in wavelength of the scattered photon by Compton scattering? Also give reason why the Compton shift is detectable only in X-rays region and not in visible range of light? **(3+1)**

OR

Derive Schrödinger ‘s time independent wave equation. What is the physical significance of wave function Ψ used in this equation? **(3+1)**

5. Give the construction and working of semiconductor laser. Draw necessary energy level diagrams. **(1+3)**

OR

Discuss the phenomenon of Fraunhofer’s diffraction at a single slit and derive expression for the intensity of diffracted light.

3. Attempt all the questions. (2×6 = 12)

g) Explain the essential requirement for production of laser action?
h) The wavelength of sodium D- lines is 589.5Å and 588.9 Å. What is the minimum number of lines a grating must have in order to resolve these lines in the first order spectrum?
i) Explain holographic Interferometry technique?
j) A beam of γ-radiation having photon energy of 510 keV is incident on a foil of aluminum. Calculate the wavelength of the radiation scattered at ninety degrees.
k) Show that the expectation values of position of a particle in 1-D box is a/2. Here 'a' is the width of the box.
Explain working of Laurent's half-shade polarimeter?

Govt. Mahila Engineering College, Ajmer

I-Mid Term Examination-2017
B. Tech (II Semester CS A & B)
Time: - 60 Min **Subject: - Engineering Physics-II** **MM: - 20**

1. Write down Schrödinger's equation for a particle confined in a 3–D box. Obtain the wave function and Energy Eigen value for a particle confined in this box. Explain the term Degeneracy. (5)

OR

What do you mean by Tunneling? Write down Schrödinger equations for potential barrier problem and steps to find out the transmission coefficient of a particle having less energy than the height of potential barrier. (5)

2. Explain how light propagate in optical fiber. Also derive the expression for the critical angle and numerical aperture of optical fiber in terms of Fractional refractive index change. (5)

OR

Derive expression for the density of states for free electron gas in metal and hence find expression for the Fermi energy. Explain, Fermi-Dirac Distribution Function. (5)

3. Attempt any Four [2.5 × 4 = 10]
a. An X-ray photon of wavelength 0.3 Å is scattered through an angle of 60° by a free electron. Find the recoil energy of the electron.
b. Write down the Schrödinger's time dependent wave equation and derive Schrödinger's time independent wave equation from it.
c. Calculate the probability of transmission that a 1.0eV electron will penetrate a potential barrier of 4.0eV when the barrier width is 2.0Å
d. White light has a frequency range from $0.4x10^{15}$ Hz to $0.7x10^{15}$ Hz. Find the coherence time and coherence length for it.
e. Find the probability of finding a particle between 0.35a and 0.65a where 'a' is the width of the box and particle is in the first excited state.
f. Show that visibility is a measure of coherence.

Govt. Mahila Engineering College, Ajmer
II-Mid Term Examination-2017 B. Tech (II Semester)
Time: - 60 Min **Subject: - Engineering Physics-II** **MM: - 20**

Attempt all the Question.

1. With the help of schematic diagram, discuss basic requirements of holographic laboratory. What is the application of holography in holographic microscopy? **(4)**

OR

1. Derive a relation between Einstein's coefficients. Explain the essential requirement for production of laser action. How could probability of stimulated emission be increased? **(4)**

2. Describe construction, working and application of Scintillation Counter. Explain why scintillation detectors are more sensitive than gas-filled detectors. **(4)**

OR

2. Describe the construction and working of Geiger-Muller Counter with the help of suitable diagram. How quenching can be achieved in GM counter? **(4)**

3. Short answer type Questions. **(2×6=12)**

a) What is the role of helium atoms in He-Ne laser? Draw only necessary energy level diagram for He-Ne laser (No working).
b) Calculate the number of modes, pulse separation for a given laser having line width 1.1×10^{11} Hz and the length of laser rod is 2-meter long.
c) Distinguish between the mechanism and characteristics of spontaneous emission and stimulated emission.
d) Write a Short note on Q Switching ***OR*** Mode Locking.
e) Explain how lasing action is achieved in a semiconductor laser?
An ionization chamber exposed to a beam of α particles registers a current of 4.8×10^{-13} ampere. On the average 20 α particles enter the chamber per second. Calculate the energy of the α particle. [assume that in producing ion pairs 35 eV per ion pair energy is needed].

Govt. Mahila Engineering College, Ajmer

I Mid Term Examination-2015-16
{I-BTech (I Semester)}
(Common for Section E, F & G)
Subject: - Physics-I

Time: - 60 Min **MM: - 20**

1. Attempt all the questions.

a) In Newton's ring experiment, the diameters of 10th dark ring are reduced to half of its value on introducing a liquid below the convex surface. Calculate refractive index of liquid. (2)
b) Michelson interferometer experiment is performed with a source which consists of two wavelengths 4882 Å and 4886 Å. Through what distance does the mirror have to be moved between two positions of disappearance of fringes. (2)
c) What will be effect on Newton's rings if: Plano Convex lens is raised by a given height? (2)
d) A glass microscope lens (μ= 1.5) is coated with magnesium fluoride (μ=1.38) film to increase the transmission of normally incident light $\lambda = 5000\text{Å}$. What minimum film thickness should be deposited on the lens? (2)
e) Diffraction pattern of a single slit of width 0.5 cm is formed by a lens of focal length 40 cm. Calculate the distance between the first dark and the next bright fringe from the axis. Given the wavelength is 5000Å. (2)
f) Differentiate between Interference and Diffraction. (2)

2. With schematic diagram, explain the working of a Michelson 's interferometer. Obtain the expression for radii of circular interference fringes. (1+1+2)

OR

Explain why Newton Rings are circular in shape. Prove that in reflected system diameter of bright rings are proportional to square root of odd natural number. Why is central fringe a dark spot? (1+2+1)

Discuss the phenomenon of Fraunhofer diffraction at single slit and show that the intensities of successive maxima are nearly in the ratio - 1 : 1/22 : 1/61 : 1/121 (2+2)

Government Mahila Engineering College, Ajmer

I Mid Term Examination-2015-16 {I-BTech (II Semester)}

Subject: - Physics-II

Time: - 60 Min
MM: - 20

Attempt all the questions.

1. What do you mean by quantum mechanical tunneling? Show that the tunneling probability is given by the expression.

$$T = \frac{16E(V_0 - E)}{V_0^{\,2}} e^{-2\alpha a}$$

Where V_0 = height of the rectangular potential barrier. Show the variation of T with particle energy E and barrier width *a*, draw graphs. **(2+3)**

OR

1. Solve Schrödinger's equation for a particle trapped in three-dimensional cubical box of side ***a*** **.**Explain the following: (i) Degeneracy (ii) Six Fold degenerate state. **(3+1+1)**

2. Derive Schrödinger's time dependent wave equation. What is the physical significance of wave function used in this equation? **(2+2)**
3. What is 'Compton scattering'? Obtain an expression for shift in wavelength of the scattered photon by Compton scattering? **(1+3)**
4. Find the probability of finding a particle between 0.35a and 0.65a where 'a' is the width of the box and particle is in the first excited state. **(3)**
5. An X-ray photon is found to have its wavelength doubled on being scattered through 90^0. Find the wavelength and energy of the incident photon. **(2)**
6. Prove that wave function for a free particle in One Dimensional Box is orthogonal. **(2)**

Government Mahila Engineering College, Ajmer

II Mid Term Examination-2015-16 {I-BTech (I Semester)}

Subject: - Physics-I

Time: - 60 Min **MM: - 20**

Attempt all the questions.

1. State postulates of special theory of relativity and using them derive Lorentz transformation Equation. **(2+2)**

OR

1. Derive Energy mass relation. Compute the mass and velocity of an electron having kinetic energy 1.5 MeV. **(2+2)**
2. Derive an expression for the Angular width of Principal Maximum and hence explain the condition of normal spectrum? **(3+1)**

OR

2. Derive an expression for the conductivity of intrinsic semiconductor. Derive an expression for the determination of energy band gap in a Semiconductor? **(3+1)**

3. Short answer Type Question.

(i) Explain Rayleigh criteria of just resolution of two spectral lines of equal intensities?

(ii) A sodium discharge lamp produces two intense wavelengths in the yellow region of visible spectrum at 589.0 nm and 589.6 nm. Can the transmission grating with 1200 elements resolve principal maxima in the first order?

(iii) An electric field of 110 Volt/m is applied to a sample of n type semiconductor whose Hall coefficient is $-0.0125 m^3 C^{-1}$. Determine the current density in sample assuming $\mu_n = 0.40 m^2 v^{-1} s^{-1}$.

(iv) Derive Braggs Equation. Explain why we cannot use visible light for studying the crystal structures.

(v) Prove that under condition (v<<c), relativistic kinetic energy, changes to classical kinetic energy.

(vi) Calculate the percentage contraction of a rod moving with a velocity 0.9c in a direction at 45^0 to its own length. **(2×6=12)**

Govt. Mahila Engineering College, Ajmer
II-Mid Term Examination-2016 B.Tech (II Semester)

Time: - 60 Min **Subject: - Engineering Physics-II** **MM: - 20**

Attempt all the Question.

1. **Short answer type Questions.** **(2×6=12)**

A. What is the role of helium atoms in He-Ne laser? Draw only necessary energy level diagram for He-Ne laser (No working).

B. A mercury lamp has a bandwidth 1000 MHz. Calculate the coherence length and coherence time of its light.

C. Differentiate between Temporal Coherence and Spatial Coherence. (Any Four)

D. Write a Short note on Q Switching *OR* Mode Locking.

E. Explain the essential requirement for production of laser action.

F. Show that Visibility is a measure of degree of coherence.

2. Give basic requirements of holographic laboratory with diagram. Write one of the applications of holography? **(4)**

OR

2. Derive the expression for the critical angle and numerical aperture of optical fiber in terms of Fractional refractive index change. **(4)**

3. Describe the basic principle of Gas Filled detectors with the help of suitable diagram, Explain, six region curve for the same. **(4)**

OR

3. Describe the construction and working of Geiger-Muller Counter with the help of suitable diagram. How quenching can be achieved in GM counter? **(4)**