Section-A

UNIT -1

1. What is wave function? Write its physical significance also.
2. What are the characteristics of wave function?
3. Differentiate between Electromagnetic Wave and Matter wave.
4. Discuss the spectral distribution curve of black body radiation.
5. State Wien's displacement law.
6. Explain Stefan's law.
7. What are phase and group velocities?
8. Is the wavelength of electron on different orbits, same or different? If different what is the ratio of the wavelength in first and 4th orbit?
9. What is Compton effect and Compton shift?

UNIT -2

10. Discuss the equation of continuity?
11. Write down the four Maxwell's equations in integral forms.
12. What is skin depth?
13. What is Poynting vector? Write its unit and dimensions.
14. What do you understand by the concept of displacement current?

Section-B

UNIT -1

a. What are de-Broglie waves? How do they help in the interpretation of Bohr's quantization rule?
b. Calculate the de' Broglie wavelength associated with a proton moving with a velocity equal to 1/20 of velocity of light.
c. Find the de-Broglie's wavelength of a neutron of energy 12.8 MeV.
d. An X-ray photon is found to have its wavelength doubled on being scattered through 90°. Find the wavelength and energy of the incident photon.
e. Find the probabilities of finding a particle trapped in a box of length L in the region from 0.45L to 0.55L for the ground and first excited state.
f. Find the de-Broglie's wavelength of an electron which is accelerated through a 100 eV potential difference.
f. An electron and photon moving with speed 'v' and 'c', respectively have the same de Broglie wavelength. Find the kinetic energy and momentum of an electron and that of a photon.
g. An electron is bound in one dimensional potential box which has width 2.5×10^{-10} m. Assuming the height of the box to be infinite , calculate the lowest two permitted energy values of the electron.

UNIT -2

h. If the earth receives 2 Cal/min-cm^2 solar energy. What are the amplitudes of vector E and vector H of radiations?
i. For silver, $\mu = \mu_0$ and $\sigma = 3\times10^7$ mhos/m. Calculate the skin depth at 10^9 Hz frequency. Given, $\mu_0 = 4\pi\times10^{-7}$ N/A^2.
j. Assuming that all the energy from a 1000-watt lamp is radiated uniformly; calculate the average values of the intensities of electric and magnetic fields of radiation at 2 m from the lamp .

k. For a conducting medium, $\sigma = 5.8 \times 10^6$ Siemens/m and $\varepsilon_r = 1$. Find out the conduction and displacement current densities if the magnitude of electric field intensity E is given by E=150 sin (10^{10} t) Volt/m.
l. The relative permittivity of distilled water is 81. Calculate the refractive index and velocity of light in it.

Section-C

UNIT -1

1. Derive Schrodinger's time-independent and time-dependent wave equations.

2. Write down the Schrodinger's wave equation for a particle in one dimensional box and solve it to find out the Eigen values and Eigen function.
3. What do you understand by Compton Effect? Derive an expression for the Compton shift.
4. Discuss the Davisson & Germer experiment to verify the wave particle duality.
5. Derive the expressions for phase and group velocities and prove that $V_p V_g = C^2$

UNIT -2

6. Explain the concept of Maxwell's displacement current and show how it modifies Ampere's law.
7. Derive electromagnetic wave equation in free space. Show that the velocity of plane EM wave in free space is given by $c = 1/\sqrt{\mu_0 \varepsilon_0}$.
8. Prove that electromagnetic waves are transverse in nature.
9. State and explain the Poynting theorem for energy flow in electromagnetic waves.
10. Discuss the plane electromagnetic wave in conducting media.