Assignment -1

B.Sc. SEM-V Paper CC-303

Unit- 1 (Electromagnetics)

Q: 1 Derive maxwells equations for steady and time varying electromagnetic field and obtain corrected amperes law.

Q:2 Obtain Lorentz gauge condition. Hence show that the scalar and vector potential satisfy same equations.

Q:4 State and prove Poynting theorem.

Q:5 In a non conducting media write plane wave field equations and obtain its solutions. From this solution, show that both $\vec{E}$ and $\vec{H}$ are perpendicular to the propagation vector.

Q:7 Write the equations of plane wave in a conducting medium and using them show that a plane wave can not propagate in conducting medium without attenuation.

Q: 8 Write not on Skin effect. In case of sea water why the radio communication with submarines become difficult at the depth of several meters.

Q:9 Explain hysteresis loop by considering a torroidal coil wounded around an iron core in the form of a ring.

Unit-3 (Nuclear Physics)

- **α Rays**

Q-1. Describe range of α particles in detail. State Geiger-Nuttle rule and draw graph of Geiger-Nuttle rule for α particle.

Q-2. Discuss fine structure of α ray spectrum in detail.

Q-3. Write a short note on long range α particles.

Q-4. If kinetic energy of α particle is K_α then prove that disintegration energy of α emission is given as

$$Q_\alpha = K_\alpha \left(\frac{A}{A-4}\right).$$

Ex-1 $_{83}Bi^{212}$ decays with a half life time of 60.5 min. by emitting 5 groups of α particles with energy 6.08 MeV, 6.04 MeV, 5.76 MeV, 5.62 MeV and 5.60 MeV. Calculate the α disintegration energies. What is the daughter nucleus? Sketch its level scheme.

Ex-2 Show that $_{94}Pu^{236}$ is unable against α decay. (Given: M_{Pu} = 236.04607 u, M_U = 232.03717 u, M_α = 4.0260 u).

- **β-rays**

Q-1. Write a note on characteristics of continuous spectrum of β-rays. Discuss the difficulties arises in understanding results of it.

Q-2. Discuss Pauli's neutrino hypothesis to explain β ray continuous spectrum.

Q-3. Derive an expression of Factor for Density of States ***ρ(E)*** (Number of available energy states per unit energy range).

Q-4. Discuss Selection rules for nuclear transition β decay process.

Q-5. Discuss Cowan and Reines experiment to detect neutrino during β decay.

Ex-1 . Calculate the energy of γ rays emitted in the βdecay of $_{13}Al^{28}$ (Given E_{max} = 2.86 MeV, M_{Al}^{28} = 27.981908 u, M_{Si}^{28} = 27.976929 u).

Ex-2 . Find the energy of a neutrino in the following K-capture reaction:

$$_{55}Cs^{133} + {}_{-1}e^{0} \rightarrow {}_{54}Xe^{133} + \upsilon$$

The total energy released in this process is 355 keV and the binding energy of the K-electron in $_{54}Xe^{133}$ is 35 keV. Further the daughter nucleus is formed directly in the ground state.