KATWA COLLEGE

DEPARTMENT OF PHYSICS
INTERNAL ASSESSMENT EXAMINATION-2022
SEMESTER-VI
Paper: DSE-4   F.M: 10
Subject: Astronomy and Astrophysics   Time: 1 hour

1. Answer any five questions from the followings: -   5x2=10

a) The apparent magnitude of the Sun is -26.81 and that of the full Moon is -12.74, which one of them is bright and by how much?

b) What is the coordinate of the Universal equatorial system? Show that for an observer, the altitude of the North Pole is equal to the observer's latitude.

c) What do you mean by Sidereal time? Show that the stars which appear at midnight today appear at noon after six months.

d) Why both the very hot stars and cold stars do not show Balmer lines in their spectra?

e) What is solar granulation? What is the reason behind this granular structure of the photosphere?

f) What is Bolometric correction? How this correction is important in getting proper absolute magnitude of the star?

g) What is H-R diagram? Why it is very important in Astronomy?

h) What do you mean by light gathering power and resolving power of a telescope? Calculate the resolving power of a telescope having diameter of 2.0 m, when a radiation of wavelength 6000 Angstrom is detected.

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INTERNAL ASSESSMENT EXAMINATION-2022
SEMESTER-VI
Paper: CC-XII   F.M: 10
Subject: Electromagnetic theory   Time: 1 hour

1. Answer any five questions from the followings: -   **5x2=10**

a) Show that Maxwell's equations are consistent with the equation of continuity. The magnetic field intensity in free space is given by $\vec{H} = H_o \, Sin(\omega t - kz)\hat{y}$ A/m. Calculate the displacement current density.

b) Define Poynting vector. What does it represent? The electric field intensity in a perfectly dielectric medium is given by

$\vec{E} = E_o \, Cos(\omega t - kx)\hat{x}$ V/m. Determine Poynting vector of this wave.

c) What is intrinsic impedance of the medium? Find out the intrinsic impedance of the free space.

d) What is skin depth of the medium? On which factors it depends? In this perspective, explain why metals are opaque in visible range?

e) Show that the superposition of a left-handed and a right-handed circularly polarized light produces a plane polarized light. Determine the nature of polarization of the wave if the electric field intensity is given by $\vec{E} = 3 \, Cos \left(\omega t - kx - \pi/4 \right)\hat{y} + 4 \, Sin \left(\omega t - kx - \pi/4 \right)\hat{z}$ V/m.

f) State Poynting theorem. Find out the expression of field momentum density of a plane electromagnetic wave propagating in vacuum with electric field amplitude E_o.

g) What is plasma frequency? Discuss the importance of plasma frequency in the transmission of radio waves through the ionosphere?

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DEPARTMENT OF PHYSICS
INTERNAL ASSESSMENT EXAMINATION-2022
SEMESTER-IV
Paper: CC-IX   F.M: 10
Subject: Elements of modern physics   Time: 1 hour

1. Answer any five questions from the followings: -   5x2=10

a) What is ultraviolet catastrophe? Write down the unit and dimension of Planck's constant h.

b) Why does photoelectric effect take place only when photons strike bound electrons?

c) If the photoelectric threshold of wavelength of sodium is $5420\ \dot{A}$, find the work function and the maximum kinetic energy of the photoelectrons ejected by the incident light of wavelength $4000\ \dot{A}$.

d) Why does unmodified line appear with the modified line in Compton scattering?

e) What is the ratio of de-Broglie wavelength of a proton and an alpha particle if both are accelerated by same electric potential difference?

f) Explain why electron cannot stay inside the nucleus.

g) Find the radius of $^{64}_{29}Cu$ nucleus given the radius of $^{27}_{13}Al$ nucleus is 3.6 fm. Why does the number of neutrons in a nucleus increase with the increase of mass number?

h) Predict the ground state and parity of $^{27}_{13}Al$ and $^{33}_{16}S$.

i) Using the semi-empirical mass formula, find the most stable isobar for a nucleus having odd A.