B. Sc. 6th Semester (Honours) Examination, 2020

PHYSICS
(Electromagnetic Theory)
Paper: 601/C-13/T-13
Course ID: 62411

Time: 1 Hour **Full Marks: 12**

The figures in the margin indicate full marks.

Candidates are required to give their answer in their own words as far as practicable.

Section - I

1. Answer *any two (02)* of the following questions: **2×1=2**

(a) What is plasma frequency?

(b) Define Poynting vector.

(c) Distinguish between the conduction and displacement current.

(d) What do you mean by ‘Double Refraction’?

(e) What is the main advantage of Babinet’s compensator over a half wave or quarter wave plate?

(f) How does normal component of $\vec{B}$ change across the boundary between two mediums.

Section – II

2. Answer *any one (01) of* the following questions: **4×1=4**

(a) What do you mean by circularly and elliptically polarized light?

A certain length (l_1) of 6% optically active solution rotates the plane of polarization of light by 22^0. How much length of 15% solution of the same substance will cause rotation of 30^0.

1+1+2

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(b) Define step index fiber and graded index fiber.

An optical fiber of length 10 km is formed by joining optical fibers of 1 km each with connectors that give attenuation of 0.75 dB each. This optical fiber of length 10 km has also an attenuation of 1.8 dB/km. What will be the minimum optical power that must be launched on the fiber to maintain a mean optical power level of 0.2 μw at the detector?

1+1+2

(c) Calculate the magnetic vector potential of an infinite solenoid with 'n' turns per unit length, radius R and carrying current I.

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Section - III

3. Answer *any one (01)* of the following questions: 6×1=6

(a) Considering TE or TM waves propagating along a rectangular waveguide with perfectly conducting walls, find (i) the cut-off wavelength (λ_c) and (ii) the guide wavelength (λ_g). 3+3

(b) Obtain the Maxwell's wave equations for the propagation of an electromagnetic wave in a conducting medium. Define skin depth. 5+1

(c) What is the Gauge transformation in connection to electric and magnetic fields? Find an expression for radiation pressure when electromagnetic wave falls on a perfect absorber. 4+2