Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATION - DECEMBER 2022
I SEMESTER B.Sc (Applied Sciences) in Engg.

PHYSICS - I [IPH 111 - S2]

Marks: 50   **Duration: 180 mins.**

Answer all the questions.

Missing data, if any, may be suitably assumed

Useful constants

Planck's constant $h = 6.63 \times 10^{-34}$ Js,   Velocity of light $c = 3 \times 10^8$ ms^{-1}.

Charge on electron $= 1.6 \times 10^{-19}$ C.   Mass of electron $= 9.1 \times 10^{-31}$ kg.

Mass of proton $= 1.67 \times 10^{-27}$ kg.   Boltzmann constant: 1.38×10^{-23} J/K

Stefan-Boltzmann Constant: 5.67×10^{-8} W/m^{2}K^4 Avogadro's number : 6.022×10^{23}

1)

  A)   Find the sum of the following quantities graphically using phasors;   (4)
$E_1 = 12 \sin(\omega t)$,
$E_2 = 10 \sin(\omega t + 45º)$.

  B)   Derive an expression for intensity of diffraction pattern in the case of single slit, using phasor method.   (4)

  C)   Discuss Polarization by selective absorption   (2)

2)

  A)   Show that the group speed of a wave-packet is equal to the particle speed.   (4)

  B)   A circularly shaped blackbody of surface area 1 cm^2 is placed inside an enclosure. The enclosure has a constant temperature 27°C and the blackbody is maintained at 327°C by heating it electrically. What electric power is needed to maintain the temperature ? How does this power change if a cylindrical blackbody of surface area 2 cm^2 is used instead.   (3)

  C)   A soap film (n = 1.33) in air is L= 320 nm thick. If it is illuminated with white light at normal incidence, what color (λ=?) will it appear to be in reflected light?   (3)

3)

  A)   A pendulum with a 1.00-g bob has a massless string 250 mm long. The period of the pendulum is 1.00 s.   (4)
(i) What is its zero-point energy?