[Time: 2 Hours]   [Marks: 60]

Please check whether you have got the right Question Paper

N.B.
1. **Question no 1 is compulsory**
2. **Attempt any three questions from Q.2 to Q.6**
3. **Use suitable data wherever required**
4. **Figures to the right indicate full marks.**

Q.1	Attempt any five of the following.	15
A	How interference of light is produced by (i) division of wave front and (ii) division of wavelength?	
B	Give any three points of differentiation between interference and diffraction of light.	
C	Numerical aperture of an optical fiber is 0.5 and core refractive index is 1.54. What is the refractive index of the cladding?	
D	Differentiate between spontaneous and stimulated emission.	
E	Explain dot product of two vectors.	
F	Calculate the phase shift if the Lissajous pattern obtained is an ellipse with major axis of 2 cm and minor axis of 0.8 cm.	
Q.2 A	Obtain the condition for maxima and minima of the light reflected from a thin transparent film of uniform thickness. A parallel beam of monochromatic light of wavelength 5890 A° is incident normally on a thin film of refractive index 1.5. Find the minimum thickness of the so that it appears dark in the reflected light.	08
B	Derive an expression for numerical aperture of a step index fiber.	07
Q.3 A	What is diffraction grating? What is diffraction element? In a plane transmission grating, the angle of diffraction for the second order principal maximum for the wavelength 5×10^{-5} cm is 30°. Calculate the number of lines per centimeter on the grating surface.	08
B	With neat sketch explain construction, working with energy level diagram and specialty of Nd:YAG laser.	07
Q.4 A	Define a field. What are scalar and vector fields?	05
B	Draw a schematic diagram and explain construction and working of CRT.	05
C	A wedge shaped air film having angle of 40 seconds is illuminated by monochromatic light. Fringes are observed vertically through a microscope. The distance between 10 consecutive dark fringes is 1.2 cm. Find wavelength of monochromatic light.	05
Q. 5 A	Explain magnetostatic focusing and calculate pitch of the helix.	05
B	Show that the divergence of a curl of a vector is zero.	05
C	What is the radius of helical path of an electron with speed 3×10^7 m/s enters uniform magnetic field B = 0.23 Wb/m² at 45° angle to B.	05
Q.6 A	Differentiate between photography and holography.	05
B	With the schematic diagram of SEM explain its construction and working.	05
C	Newton's rings experiment, the diameter of the 5th ring was 0.336 cm and that of 15th ring was 0.59 cm. Find the radius of curvature of the planoconvex lens if the wavelength of light used is 5890 A°.	05

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