No. of Printed Pages : 04

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 49902 Roll No.

B. Tech Examination 2023-24

(Odd Semester)

ENGINEERING PHYSICS

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : $1 \times 8 = 8$

   (a) What do you mean by optic axis?

   (b) What do you mean by coherent sources?

   (c) What do you mean by grating element?

   (d) Define ~~metastable~~ state.

   (e) What is numerical aperture?

   (f) What was the objective of conducting the Michelson-Morley experiment?

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(g) What is ~~holography~~? Specific rotation

(h) Show that the nest mass of a photon is zero.

SECTION – B

2. Attempt any two parts of the following. $6 \times 2 = 12$

(a) A thin film of soap solution is illuminated by white light at an angle of incidence $i = \sin^{-1}(4/5)$. In reflected light, two dark consecutive overlapping fringes are observed conresponding two wavelengths 6.1×10^{-7}m and 6.0×10^{-7}m. The refractive index for soap solution is 4/3. Calculate the thickness of the film.

(b) A communication system uses a 10 km fibre 1000 Watt lamp having a loss of 2.5 dB/Km. Compute the output power if the input power is 500 μ W.

(c) A clock keeps correct time. With what speed should it be moved relative to an observer so that it may appear to lose 4 minutes in 24 hours.

(d) A sugar solution in a tube of 20 cm produces optical rotation of 13°. The solution is then diluted to one-third of its previous concentration. Find the optical rotation produced by 30 cm long tube containing the diluted solution.

SECTION – C

3. Attempt any two parts from each question. Each part carry equal marks. $8 \times 5 = 40$

(a) Describe the formation of Newton's ring in reflected light. Prove that in reflected light the diameter of dark rings are proportional to the square root of natural numbers.

(b) Describe Fraunhofer diffraction due to a single slit and deduce the positions of the maxima and minima. Show that the relative intensities of the successive maxima are nearly $1 : 4/9\,\pi^2 : 4/2\,\pi^2 : 4/49\,\pi^2$.

(c) What is polarised light? How will you produce and detect plane, elliptically and circularly polarised light?

4. (a) Describe the Rayleigh's criterion for resolution. Derive an expression for the resolving power of grating.

(b) Define Einstein's coefficient of absorption, spontaneous emission and induced emission. Obtain relationship between them.

v_g & v_g
& $v_p \cdot v_g = c^2$

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(c) What do you understand by the modes of an optical fibre? Disuss the merit and demerits of single mode fibres over multimode fibre.

5. (a) Derive Lorentz transformations and use them to find out the expression for length contraction.

(b) Draw a neat diagram of He-Ne laser and describe its method of working. What are the characteristics of laser beam?

(c) Describe the construction and working of a Nicol prism. How it can be used as a polariser and analyser?

6. (a) Explain the principle of holography using construction and reconstruction of images.

(b) Deduce Einstein's mass-energy relation $E = mc^2$ and discuss it. Give some evidence showing its validity.

(c) Discuss the effect of introducing a thin plate in the path of one of the two interfering beams in biprism experiment. Deduce the expression for displacement of fringes.

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