# B. Tech Examination 2022-23

## (Special Carry Over Paper)

### PHYSICS-I

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

**Note :–** Attempt all questions.

### SECTION – A

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

   (a) Two independent sources could not produce interference, why?

   (b) What is the relation betwween phase difference and corresponding path difference?

   (c) What do you mean by resolving power?

   (d) What do you mean by optic axis?

   (e) How can you say that He-Ne laser is superior to Ruby laser?

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(f) Define population inversion.

(g) What is numerical aperture?

(h) What is a hologram?

## SECTION – B

2. Attempt all parts of the following : 6×2=12

(a) At what speed should a clock be moved so that it may appear's to lose one minute in each hour?

(b) A communication system uses a 10 kilometer fiber having a loss of 2.5 dB/km. Calculate the output power if the input power is 500 μW.

(c) White light is incident on a soap film at an angle $\sin^{-1}(4/5)$ and the reflected light is observed with a spectroscope. It is found that two consecutive dark bands corresponds to wavelength ($\lambda$), $6.1 \times 10^{-5}$ cm and $6.0 \times 10^{-5}$ cm. If the refractive index of the film be (4/3), calculate the thickness.

(d) Calculate the specific rotation if the plane of polarisation is turned through $26.4^0$, traversing 20 cm length of 20% sugar solution.



## SECTION – C

Note :– Attempt all questions. Attempt any two parts from each question. 5×8=40

3. (a) Show that the diameter $D_n$ of the $n^{th}$ Newton's ring, when two surfaces of radii $R_1$ and $R_2$ are placed in contact, is given by the relation :

$$\frac{1}{R_1} \pm \frac{1}{R_2} = \frac{4n\lambda}{D_n^2}$$

(b) Give the construction and theory of plane transmission grating and explain the formation of spectra by it. Explain what are the absent spectra in the grating?

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

4. (a) Derive the Galilean transformation equations and show that its acceleration is invariant under Galilean transformation.

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

(c) State and explain acceptance angle and acceptance cone of an optical fiber. Deduce the expression for numerical aperture.

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

(b) Draw a neat diagram of He-Ne laser and describe its method of working. Discuss its important applications.

(c) What is the basic principle of holography? Discuss the main characteristic and applications of holography.

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

(b) Define specific rotation. Describe the construction and working of laurent's half shade polarimeter.

(c) What are Einstein's coefficients? Obtain a relation between them. Also discuss the essential conditions for laser action.

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