(b) Describe construction and working of a nicol prism. Explain how it can be used as a polariser and as an analyser.

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

6. (a) Discuss the construction and re-construction of image of a hologram.

(b) What is laser? Discuss the construction and working of He-Ne laser, explaining the principle of population inversion.

(c) What do you mean by time dilation? Deduce an expression for the time dilation on the basis of lorentz transformation equations. Give an example to show that time dilation is real effect.

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

PAPER ID : 39902 Roll No.

B. Tech. Examination 2021-22

(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) What are coherent sources?

(b) Define population inversion.

(c) What is active medium in He-Ne laser?

(d) What is numerical aperture?

(e) What do you mean by proper length?

(f) What are doubly reflecting crystals?

(g) What is hologram?

(h) What do you mean by diffraction grating?

SECTION –B

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

(a) If the total energy of a particle is exactly thrice its rest energy, what is the velocity of the particle ?

(b) Calculate numerical aperture and hence the acceptance angle for an optical fiber given that refractive indicies of the core and cladding are 1.45 and 1.40 respectively.

(c) Newton's rings are observed normally in reflected light of wav length 6000 Å . The diameter of 10^{th} dark ring is 0.50 cm. Find the radius curvature of the lens and thickness of the film.

(d) Calculate the minimum number of lines in a grating which will just resolve the lines of wavelength 5890 Å and 5896 Å in the second order.

SECTION –C

Note:- Attempt all questions. Attempt any two parts from each questions. $5 \times 8 = 40$

3. (a) Explain the phenomenon of interference in thin film due to reflected light.

(b) Give the theory of plane transmission grating and show how would you use it to determine the wavelength of light?

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

4. (a) Explain Rayleigh criteria for limit of resolution. Obtain an experssion for resolving power of grating.

(b) Derive an expression for conditions of brightness and darkness in case of interference in thin film of non- uniform thickness.

(c) Derive an expression for the mass-variation with velocity in the relativistic range.

5. (a) Explain single mode and multimode fibers. Also discuss about the power loss in optical fibers.