

PG CBCS
M.Sc. Semester-IV Examination, 2022
PHYSICS
 PAPER: PHS 403
(SEMICONDUCTOR DEVICES & APPLIED OPTICS)

Full Marks: 40

Time: 2 Hours

Write the answer for each unit in separate sheet

The figures in the right-hand margin indicate full marks.
 Candidates are required to give their answers in their own words as far as practicable.

PHS 403.1 Semiconductor Devices

Marks: 20

GROUP-A

1. Answer any two question:

2×2=4

- a) What is the advantage of semiconductor controlled rectifier (SCR) over a p-n-p-n diode?
- b) What are the basic assumptions of quantum Hall effect?
- c) How mobility varies with temperature in a non-degenerate semiconductor?
- d) Why a SCR is also known as a thyristor?

GROUP-B

2. Answer any two questions:

2×4=8

- a) Derive the relation between I_D and V_D in a JFET.
- b) Discuss with diagram the upper valley and lower valley in a Gunn diode.
- c) Discuss the triggering mechanism of a semiconductor controlled rectifier (SCR).
- d) "p-n-p-n diode can be considered as equivalent to two coupled transistors", explain.

GROUP-C

3. Answer any one questions:

1×8=8

- a) Discuss different region of a tunnel diode with a neat figure. (8)
- b) What is Gunn effect? Derive the expression of the drift velocity of Gunn Diode. (2+6)

PHS 403.2 Applied Optics

Marks: 20

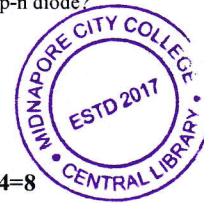
GROUP-A

1. Answer any two question:

2×2=4

- a) State the conditions for multi photon absorption process to generate higher energetic photons than absorbed photons.
- b) What are the applications of Pokel's cell? Give the names of two organic materials could be used as Pokel's cell.
- c) What are the allowed crystal structures of a Biaxial crystals?

(Turn Over)

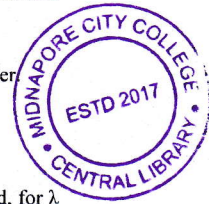


GROUP-B

2. Answer any two questions:

2×4=8

- a) Compute the intermodal dispersion per kilometer of length of the fiber and the total dispersion in a 15 m length of the step-index fiber with a core of refractive index 1.55 and cladding of refractive index 1.51.
- b) Explain reconstruction of images from holographic plate with proper diagram.
- c) Deduce the expression for total time delay due to modal dispersion in Step-Index fiber.



GROUP-C

3. Answer any one questions:

1×8=8

- a) Drive the V-number (normalized frequency) of an optical fiber with inner diameter d , for λ wavelength of light, where n_1 & n_2 is refractive index for inner and outer core respectively. What is graded index fiber? Discuss its advantages over a step-index fiber. (4+2+2)
- b) What is optical confinement factor? Deduce the condition for achieving laser oscillations in a quantum well laser. What do you mean by zero dispersion fibers? What are dispersion compensating fibers? (1+3+2+2)
