Reg. No ..... Name **26P453**

M. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2026

SEMESTER 4 : PHYSICS

COURSE : **24P4PHYT16EL : OPTOELECTRONICS**

(For Regular 2024 Admission)

Time : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1. The threshold current density is lower in
(A) Hetrojunction laser (B) Distributed Feedback Laser (U)
(C) Homojunction Laser (D) Gas laser

2. Semiconductor laser is a
(A) Four level laser (B) three level Laser (R)
(C) two level Laser (D) Five level laser

3. In passive mode locking
(A) External power is required
(B) No External power is required (R)
(C) Need passive circuit elements
(D) Need Active circuit elements

4. In a homojuction laser if 'L' is the length of the cavity 'n' refractive index and 'm' an integer, condition for a sustained mode is given by
(A) $m\frac{\lambda}{2n} = L$ (B) $n\frac{\lambda}{2m} = L$ (C) $\frac{mn}{2\lambda} = L$ (D) $\frac{m}{2\lambda} = L$ ()

5. SHG is a special case of
(A) Frequency up conversion
(B) Frequency down conversion (R)
(C) No power flow between the waves
(D) intensity distribution

6. In Franz-Keldysh effect, the energy of the absorbed photon is
(A) Equal to band gap energy
(B) greater than band gap energy (R)
(C) less than band gap energy
(D) Very less than band gap energy.

7. For biasing a phototransistor, the base junction should be
(A) Forward biased (B) Reverse biased (R)
(C) Open (D) Moderately biased.

8. If the energy of photons incident on the semiconductor material is less than the band gap of the material, then the material will act as a
(A)Direct band gap material (B) indirect band gap material (C) Window material (D) Material change from Indirect to direct band gap. ()

9. In the case of Kerr effect (A) n = n(E) (B) n = n(E^2) (C) n = n(E^3) (D) n = n(E^4) ()

10. The photocurrent in a photodiode is caused by
(A) Minority carriers (B) Majority carriers (U)
(C) Both (A) and (B) (D) Dark current.

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	Write a short note on solar energy spectrum.	()
12.	Differentiate between quantum efficiency and responsivity.	()
13.	Differentiate between Longitudinal and transverse electro – optic modulators.	()
14.	Write short note on selection criterion for LED material.	()
15.	Explain optical and electrical band width of a photodetection system.	()
16.	What are the disadvantages of homojunction lasers?	()
17.	Explain Pockel and Kerr effects.	()
18.	Write down the laser diode equation and explain the terms involved.	()

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19.	Draw the structure of a distributed feedback laser.	()
20.	A step index fiber has a numerical aperture of 0.15. If the core refractive index is 1.45 and core diameter is 90 μm, Calculate (I) the acceptance angle and (II) the refractive index of the clad.	()
21.	Explain the working of a phototransistor. What are their advantages over an avalanche photodiode?	()
22.	Explain the theory of third harmonic generation from the basic equation.	()

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;