

B. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2021**SEMESTER –6: PHYSICS (CORE COURSE - ELECTIVE)****COURSE: 15U6CRPHY13EL: OPTOELECTRONICS**

(Common for Regular 2018 admission & Improvement 2017/Supplementary 2017/2016 /2015 admissions)

Time: Three Hours

Max Marks: 75

PART A (Very short answer questions)**Answer all questions, each question carries 1 Mark**

1. Write a mathematical expression for a Gaussian.
2. What is photonics?
3. What are excitons?
4. Define luminescence.
5. Describe how light is generated in an LED.
6. What is a PIN photodiode?
7. What is a phototransistor?
8. A photodiode is usually connected in reverse biased configuration in a circuit for light detection.
True or False?
9. What is the principle behind the zig-zag optical paths in an optical fibre?
10. The core of a single mode fibre is usually narrower compared to the core of a multimode fibre.
True or False (1 x 10 = 10)

PART B (Short answer)**Answer any Eight questions, each question carries 2 Marks**

11. Describe a heterojunction solar cell.
12. Briefly outline Stark effect.
13. Explain electron-hole pair formation in semiconductors.
14. Describe Franz Keldysh effect.
15. Define Pockels effect.
16. Describe carrier injection, recombination and excitation processes in a junction LED.
17. State any two drawbacks of a homojunction laser diode?
18. Define internal quantum efficiency of a Light emitting diode.
19. Define Birefringence.
20. With suitable sketches, show the differences between a step-index and a graded-index fibre. (2 x 8 = 16)

PART C (Problem/Derivations)**Answer any Five question, each question carries 5 Marks**

21. Illustrate radiative and non-radiative recombination.
22. Explain Light (Power)-Current and Diode current -Voltage characteristics of a Light emitting diode.

23. State the principle and operation of a junction photodiode.
24. What are quantum well lasers?
25. Describe a basic optical communication system.
26. Describe the three direct modulation methods in optical communication systems.
27. Write a short note acousto-optic modulators.

(5 x 5 = 25)

PART D (Long answer questions)

Answer any Two question, each question carries 12 Marks

28. Explain the following:
 - (a) Structure of a optical fibre
 - (b) Signal loss and attenuation mechanisms in a fibre
 - (c) Optical Fibre bundles
 - (d) Advantages of optical fibres in communication.
29. Describe the following processes with diagrams:
 - (a) Auger recombination
 - (b) Band-to-Band recombination
 - (c) Stokes Shift
 - (d) Relation between absorption and emission spectra for semiconductors
30. Draw the schematic of an edge-emitting LED and explain its structure.
31. What are optical fibres? Describe the types and classification of Optical Fibres.

(12 x 2 = 24)
