B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2020

SEMESTER – 6: PHYSICS (CORE COURSE - ELECTIVE)

COURSE: **15U6CRPHY13EL: OPTOELECTRONICS**

(Common for Regular 2017 Admission & Supplementary 2016 /2015/2014 Admissions)

Time: Three Hours   Max Marks: 75

PART A (Very short answer questions)

*(Answer **all** questions) Each question carries **1** Mark*

1. Compare electronics and photonics in the context of communications

2. Define FWHM of a Gaussian beam?

3. What is a photon?

4. State inverse square law in optics.

5. Write an equation connecting electron wave number, k, and energy, $\varepsilon\,(k)$, in the conduction band of a direct band gap semiconductor.

6. What is the main difference between an LED and a Photodiode?

7. What is photovoltaic effect?

8. An LED is usually connected in reverse biased configuration in a circuit for light detection. True or False?

9. Define numerical aperture of an optical fibre.

10. The refractive index of the cladding is …………… than that of the core.   (1 x 10 = 10)

PART B (Short answer)

*(Answer **any Eight** questions) Each question carries **2** Marks*

11. Explain electron-hole pair formation in semiconductors.

12. Describe Franz Keldysh effect.

13. Describe quadratic Stark effect.

14. Discuss exciton recombination.

15. Describe a heterojunction solar cell.

16. Sketch the light current characteristics of a light emitting diode and explain features.

17. What are the applications of LEDs.

18. What is an avalanche photodiode?

19. Define Pockels effect.

20. Classify optical fibre in terms of transmission modes.   (2 x 8 = 16)

PART C (Problem/Derivations)

*(Answer **any Five** question) Each question carries **5** Marks*

21. A laser source has 1 mW of power at 632.8 nm. Find the number of photons emitted per second from the source.

22. Calculate the momentum change due to photon absorption in InP with band gap energy 1.35 eV.

23. Draw E-K diagrams for direct band gap and indirect bandgap semiconductors.

24. Explain career confinement in heterostructure laser diodes.

25. Sketch the block diagram of a basic optical communication system and explain briefly.

26. What are single mode fibres? Explain.

27. What are the advantages of fibre optic communication?   (5 x 5 = 25)

PART D (Long answer questions)

*(Answer **any Two** question) Each question carries **12** Marks*

28. Describe light absorption and recombination mechanisms in semiconductors.

29. Explain the principle, operation and properties of a junction laser diode.

30. Describe the design and working of a (a) PIN photodiode and (b) Phototransistors.

31. What are optical fibres? Describe the types and classification of Optical Fibres.

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