Reg. No…….. Name…… **19U656**

# B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2019

SEMESTER **– 6: PHYSICS (CORE COURSE)**

COURSE: **15U6CRPHY13: OPTOELECTRONICS**

*(Common for Regular - 2016 Admission / Supplementary-Improvement 2015/2014 admissions)*

Time: Three Hours Max. Marks: 75

## Part A (Very short answer questions)

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

1. Define a point light source.
2. What is photometry?
3. Draw the energy level of donor atom in n-type semiconductor.
4. Can you observe intraband transition in n-type semiconductor?
5. What is quantum well?
6. What are the differences between LED and diode laser?
7. Give mathematical expression for attenuation associated with an optical fiber.
8. What is a photoconductive detector?
9. What are the advantages of optical communication over microwave communication?
10. Which liquid exhibit acousto optic property?

(1 x 10 = 10)

## Part B (Short answer)

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

11. Write a short note on radiance.
12. State any four radiometric parameters.
13. What is stark effect?
14. Explain Auger recombination
15. Explain pockel effect.
16. What is quantum well laser? Give its advantages.
17. Define fill factor of a solar cell and mark maximum power point on I-V characteristic curve of solar cell.
18. Draw the structure of EDGE emitting LED and explain the role of cladding layer.
19. Explain the light propagation in graded index optical fiber.
20. Write a short note on waveguide modulator.

(2 x 8 = 16)

## Part C (Problem/Derivations)

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

21. Show that for n+ - P structure the injection efficiency can be maximum.
22. Explain the band to band recombination process in semiconductor.
23. Calculate absorption coefficient for allowed transitions in GaAs at photon energy 1.52 eV. Band gap of GaAs is 1.5eV.

24. Explain working of hetero junction laser and mention the advantages of hetero junction laser over homo junction laser.
25. Calculate the number modes able to propagate through the given step index optical fiber. Given that n1=1.53, n2=1.50, wavelength =1 µm and radius =50µm.
26. Calculate the core refractive index and acceptance angle of an step index optical fiber from the following data NA=0.394 and n2=1.50.
27. An optical power of 200mW is launched in to a fiber of length 0.25km. At the receiving point the output power was measured to 10µW. Calculate the power loss in dB per kilometer.

(5 x 5 = 25)

**Part D (Long answer questions)**

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

28. Explain the flowing characteristics of Gaussian beams. (a) Irradiance profile (b) Beam spreading (c) Gaussian beam phase fronts.
29. Explain the band to band to absorption in semiconductor and also explain the effect of electric field on absorption.
30. Explain the structure and working principle of PIN photo diode. . Describe APD and its advantages over PIN photo diode.
31. With the help of a neat diagram explain the working of a magneto-optic modulator.

(12 x 2 = 24)

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