M.Sc. DEGREE (C.S.S.) EXAMINATION, JUNE 2016

Fourth Semester

Faculty of Science

Branch II : Physics—A—Pure Physics—Open Elective Bunch

PH4OE1—OPTOELECTRONICS

(2012 Admissions—Regular)

Time : Three Hours   Maximum Weight : 30

Part A

*Answer any **six** questions.*
Each question carries a weight of 1.

1. What is compensation doping ? Explain.

2. State and explain the principle of hetrojunction high intensity LED.

3. Differentiate between surface and edge emitting LEDs.

4. What is intra model dispersion ? Explain.

5. State the features of graded index optical fiber.

6. Bring out the diode laser principles.

7. What is a quantum well laser? Explain.

8. What is mode locking ? Explain.

9. Explain Pockel effect.

10. What is third harmonic generation ?

$(6 \times 1 = 6)$

Part B

*Answer any **four** questions.*
Each question carries a weight of 2.

11. What power is radiated by a LED if its quantum efficiency is 3 % and the peak wave length is 670 nm ?

12. Consider a 30 km lay optical fiber that has an attenuation of 0.8 db/km at 1300 nm. If 200 μw of optical power id launched into the fiber, find the optical out-put power.

Turn over

14. Bring out the structure of a vertical cavity surface emitting laser. State the advantages.

14. Calculate the slope efficiency of a laser diode operating at 1300 nm, if its external quantum efficiency is 0.1.

15. Estimate the minimum detectable power of a PIN diode whose responsivity is 0.5A/W and whose dark current is 1 nA.

16. Obtain the phase matching condition for second harmonic generation in the case of anisotropic crystals.

(4 × 2 = 8)

Part C

Answer all questions.
Each question carries a weight of 4.

17. (a) Explain double heterostructure. Draw the labeled schematic diagram of an edge emitting DH LED and explain the operation. Obtain the emission patern. State the salient features.

Or

(b) Discuss the different mechanisms responsible for attenuation in optical fibers.

18. (a) Discuss the laser oscillation conditions. Show that the ratio of Einstein coefficient of spontaneous emission to the Einstein coefficient of absorption of radiation is proportional to the cube of the frequency.

Or

(b) Discuss the characteristics of the emitted light by laser diodes in detail.

19. (a) Discuss the theory, construction and working of an avalanche photo diode. State the features.

Or

(b) Discuss solar energy spectrum in detail.

20. (a) Discuss the propagation of waves is an anisotropic medium which leads to nonliner polarization.

Or

(b) Bring out the theory of birefringence.

(4 × 4 = 16)