



Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : X60427

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Sixth/Seventh/Eighth Semester

Electronics and Communication Engineering

EC 2047/EC 803/EC 1011/10144 ECE 38 – OPTOELECTRONIC DEVICES

(Regulations 2008/2010)

(Common to PTEC2047 for B.E.(Part-Time) Seventh Semester-Regulations 2009)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Differentiate between Diffraction and Scattering.
2. The average electric field in a particular $2.0 \mu\text{m}$ GaAs device is 5 kV/cm . Calculate the average velocity of electron, if its mobility value is $8000 \text{ cm}^2/\text{V-s}$.
3. Calculate the output power from n^+ -p GaAs LED having an electron current of 1.0 mA , efficiency $\eta_0 = 50\%$ operating at $\lambda = 0.87 \mu\text{m}$.
4. What is meant by modulation bandwidth of LED ?
5. Calculate the maximum frequency of operation of a thermal detector with thermal time constant of 1 mS .
6. What are the limitations of Germanium based photo diodes ?
7. Define “Faraday” effect.
8. Optical switching is superior to conventional electronic switching – Justify ?
9. Compare between electronic and optonic ICS.
10. What is a planar waveguide ?

PART – B

(5×16=80 Marks)

11. a) From the Schrödinger equation, explain the formation of energy bands in solids. (16)

(OR)

- b) Derive the expressions for concentration of electrons and holes in an intrinsic semiconductor, with relevant diagrams. (16)



12. a) i) Explain the mechanism of electro luminescence emission with neat diagram. (6)
ii) Brief about the construction and operation of an AC electroluminescent device. (10)

(OR)

- b) Enumerate the principle and typical construction of a doped insulator laser, with relevant diagrams.

13. a) i) Define photoconductive gain, responsivity and quantum efficiency of photodetector. Derive expressions for them. (12)
ii) An APD has quantum efficiency of 70% at wavelength $1.3 \mu\text{m}$. An output current of $15 \mu\text{A}$ is produced by APD due to $0.5 \mu\text{W}$ incident light power. Calculate the multiplication factor of the APD. (4)

(OR)

- b) i) Describe the working of thermal detector. (8)
ii) Derive expressions for the depletion layer photocurrent and response time of photo detector. (8)

14. a) i) Explain the concept of external modulation and compare with direct modulation. (6)
ii) Explain with a neat diagram, the construction of electro optic effect based external modulator. Also deduce the expression of modulated light. (10)

(OR)

- b) i) Discuss in detail the principle and operation of a photonic switch based on self electro optic device (SEED). (10)
ii) Explain the concept of Bipolar controller modulator. (6)

15. a) Describe the fabrication process of an opto electronic integrated transmitter circuit by molecular beam epitaxy regrowth. (16)

(OR)

- b) Describe about the guided wave Mach – Zehnder interferometer and arrive at the expression for half wave voltage. (16)
-