

Registration No: -

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

Total Number of Pages: 02

B.Tech
PET5J001

5th Semester Regular / Back Examination: 2019-20
FIBER OPTICS & OPTOELECTRONICS DEVICES

BRANCH: ECE, ETC

Max Marks: 100

Time: 3 Hours

Q.Code: HRB404

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (02x10)
Suggested Words: How, Why, Determine, Derive, State, Write, Create, etc

- How does the fraction of energy traveling in the cladding for single-mode fibers?
- A step index fiber has a solid acceptance angle in air of 0.115 radians and Δ of 0.9%. Calculate the speed of light in fiber core.
- Write the condition satisfied by the Propagation Factor (β) for which a mode remains guided.
- Illustrate the expression for the Refractive Index profile of Step Index Fiber and Graded Index Fiber.
- How to minimize the inhomogeneity's for Mie scattering?
- Enlist various Source to fibre power launching techniques.
- What do you understand from pumping in LASER?
- Define the quantum efficiency and responsivity of photo detector with necessary equations.
- What do you understand by dispersion shifted fibers?
- State the principle of operation of optical amplifiers.

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (06x08)
Analyze, Justify, Design, Formulate, Calculate, Develop, Illustrate, Explain, Distinguish, Differences & Similarities

- List various special features of offered by optical fiber communication system over conventional communication system.
- Illustrate the difference between acceptance angle and critical angle using necessary equation. What is normalized frequency? How the normalized frequency (V) parameter is related to the radius of the core in optical fiber? How is it related to the number of modes (M) in a multimode fiber when (M) is quite large?
- What is Rayleigh scattering? Mention the factors that cause Scattering losses in optical fibers.
- Briefly explain about Direct Band Gap Material used for optical sources?
- What are the two main causes of intramodal dispersion in optical waveguides? Explain group delay during the propagation of the optical signal.
- What are fiber couplers? Briefly discuss about core and surface interaction type couplers.
- How carrier pair multiplication take place in gain region of Avalanche Photodiode? Briefly discuss any typical structure of the APD.
- Describe the two main SOA types and indicate their distinguishing features with neat figures.
- Discuss the operation of silicon RAPD. Outline their advantages and disadvantages in OFC.
- How modulation bandwidth can be defined in optical fiber communication? Use suitable diagrams.
- What is electro-optic modulator (EOM)? Briefly outline their application in optical fiber communication.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Discuss, Describe, Examine, Classify, Prove, Evaluate, Compare, Contrast, etc

210 2(a) Discuss the concept of the total internal reflection in optical fibers. Derive the expression for acceptance angle and numerical aperture using suitable ray diagrams. (8)210

Q3 (b) Briefly outline the material absorption losses in silica glass fibers. (8)

(a) Describe, with the aid of suitable diagram, three common techniques used for the mechanical splicing of optical fiber. (8)

210 210 210 210 210 210 210 210
Q4 (b) Explain the principle of operation of Double Hetrojunction LED using layer structure schematic and corresponding energy band diagram. (8)

Q5 (a) What are optoelectronic modulators? Explain the principle of operation for acousto-optic modulator using neat figures and enlist their limitations. (8)

210 210 210 210 210 210 210 210
2(b) Discuss the working principle of PIN photo detector with physical structure, equivalent circuit, and field distribution. (8)210

Q6 Write short notes on (8x2)
(a) SLED
(b) Erbium-Doped Fiber Amplifier (EDFA)

210 210 210 210 210 210 210 210

210 210 210 210 210 210 210 210

210 210 210 210 210 210 210 210

210 210 210 210 210 210 210 210

210 210 210 210 210 210 210 210