

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VI (NEW) EXAMINATION – WINTER 2024

Subject Code:3161005

Date:25-11-2024

Subject Name:Fiber Optic Communication

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1**
- (a) Explain Total internal reflection with the help of figure and its significance in fiber optic communication. **03**
- (b) Explain the advantages of the optical communication system using optical fiber over conventional copper system as a transmission link. **04**
- (c) Define the following. (Draw necessary figures and write equations if any) **07**
- i) Critical angle
 - ii) Numerical aperture
 - iii) Rayleigh Scattering
 - iv) Population inversion

- Q.2**
- (a) Explain Snell's law with the help of figure and equations. **03**
- (b) Explain the plasma activated chemical vapor deposition (PCVD) technique for the production of optical fiber. **04**
- (c) Give classification of dispersion and explain its effect in fiber optic communication. Mention different ways to reduce it. **07**

OR

- (c) Describe multimode step index, single mode step index and graded index fiber with the aid of simple ray diagrams. Compare the advantages and disadvantages of these fibers for use as an optical channel. **07**
- Q.3**
- (a) Define signal attenuation and derive its mathematical expression. **03**
- (b) Give the comparison of Step Index and Graded Index fibers. **04**
- (c) Describe working of an optical fiber communication system with proper block diagram in detail. **07**

OR

- Q.3**
- (a) What is equilibrium numerical aperture. Give the significance of the same. **03**
- (b) Explain the principles of operation of the laser using suitable diagrams. **04**
- (c) Discuss the significance of optical amplifier in fiber optic communication. Describe the architecture and amplification mechanism of Erbium Doped Fiber Amplifier (EDFA). **07**

- Q.4** (a) Mention the principal requirements of good optical fiber connectors. **03**
- (b) Compare Ray theory and Electromagnetic mode theory for light propagation through fiber. **04**
- (c) Explain the high radiance surface emitting LED. Highlight the drawbacks of it and how it can reduce with the help of edge emitting LED. **07**

OR

- Q.4** (a) Explain the principal of optical detection. **03**
- (b) Explain the features of Wavelength Division Multiplexing. **04**
- (c) Enlist and explain the factors that decides the performance of optical reception. Draw and explain eye diagram in detail. **07**

- Q.5** (a) List the different types of lensing schemes used in fiber optical communication. **03**
- (b) Discuss optical power loss model for a point-to-point link. **04**
- (c) Explain Synchronous optical fiber networks (SONET) in detail. **07**

OR

- Q.5** (a) Explain any one method for optical dispersion measurement. **03**
- (b) Explain the 2x2 Fiber Coupler and its function. **04**
- (c) Explain detection process in the p-n photodiode. Define the quantum efficiency and responsivity of a photo detector. **07**
