

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2018****Subject Code:2161005****Date:04/12/2018****Subject Name:Optical 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.

- Q.1** (a) Differentiate single mode and multimode optical fibers. **03**  
 (b) Explain about impact of attenuation and dispersion on signal while its propagation through optical fibers. List out various types of attenuation effects occurring in optical fiber. **04**  
 (c) Compare a conventional communication system with an optical fiber communication system. With proper block diagram describe working of an optical fiber communication system in detail. **07**

- Q.2** (a) Define terms: (a) Skew ray propagation (b) Meridional ray propagation (c) Total internal reflection with reference to optical fibers. **03**  
 (b) A multimode step index fiber having a core diameter of 80  $\mu\text{m}$  and a relative index difference of 1.5% is being operated at a wavelength of 0.85  $\mu\text{m}$ . Core refractive index value of that cable is 1.48 Calculate value of: (i) Normalized frequency of fiber and (ii) Total number of guided modes for that optical cable. **04**  
 (c) Classify linear scattering losses occurring in optical fibers and describe them in details. **07**

**OR**

- (c) Describe various Nonlinear scattering losses while signal propagation through optical fiber in optical communication systems. **07**
- Q.3** (a) Discuss in brief about various dispersion phenomena occurring while signal propagation through optical fiber in optical communication systems. **03**  
 (b) Differentiate LEDs and LASERS as optical sources. **04**  
 (c) List out factors which decide the performance of optical reception in optical communication systems. Explain the principle, characteristics and operation of avalanche photodiode. **07**

**OR**

- Q.3** (a) With the help of necessary figure properly explain DWDM in detail **03**  
 (b) List out optical sources used in optical communication systems. Explain about any one of them with necessary figures. **04**  
 (c) Draw neat sketch for OVPO Technique implementation for optical fiber fabrication process. Describe OVPO Technique in detail. **07**

- Q.4** (a) A Laser diode has lateral  $\theta = 0^\circ$  and transverse  $\theta = 90^\circ$  half power beam widths of  $2\theta = 70^\circ$  and  $35^\circ$  respectively. Calculate transverse and lateral power distribution coefficient for this diode. **03**  
 (b) The radiative and non-radiative recombination life times of minority carriers in the active region of a double heterojunction LED are 60ns and 100 ns respectively. Determine the total carrier recombination life time and optical power generated internally, if the peak emission wavelength is 0.87  $\mu\text{m}$ , and the drive current is 40 mA. **04**  
 (c) Give classification of couplers used in optical fiber communication systems. Describe each one of them briefly. **07**

**OR**

- Q.4** (a) Describe significance of use fiber connectors in optical communication link. List out various optical connectors. **03**
- (b) The radiative and non-radiative recombination life times of minority carriers in the active region of a double heterojunction LED are 50 ns and 100 ns respectively. Determine the total carrier recombination life time. When the peak emission wavelength is  $0.86\mu\text{m}$ , and the drive current is 60 mA for that working structure. **04**
- (c) Define term splicing with reference to optical fiber link. Classify various techniques of splicing and describe them briefly with suitable figures. **07**
- Q.5** (a) Discuss briefly the fabry parrot cavity resonator LASER with neat sketch. **03**
- (b) Explain working principle of EDFA used in fiber optical systems in detail. **04**
- (c) Write short note on Optical Time Domain Reflectometry (OTDR) method used in optical communication systems. **07**
- OR**
- Q.5** (a) List out differences between graded index and step index fiber cables. Define Term V number for optical fiber cable. **03**
- (b) Explain in detail about Raman amplifiers used in optical communication systems. **04**
- (c) Write short notes on Synchronous Optical Fiber Networks (SONETs) **07**

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