

## **Subject: Optical Communication (2161005)**

**Academic Year 2016-17**

**EC/Electronics**

**Assignment 1**

**Submission Date: 31/12/2016**

1. Briefly Describe the Block Diagram of Optical Communication System.
2. Draw and Explain optical transmission windows.
3. Explain Following: Reflection, Refraction, refractive index, TIR, Critical angle.
4. Derive the equation for acceptance angle , numerical aperture.
5. Compare: (i) Single mode- Multimode fiber  
(ii) Step index- Graded index
6. Explain fiber fabrication technique along with the schematic of a fiber drawing apertures.  
Also explain the OVPO technique.
7. Explain MCV and PCVD technique also compare them.
8. Explain direct method of fabrication of fiber.
9. Define MFD, Confinement factor, fiber beat length, birefringence, V number
10. Outline application of optical communication.

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**Assignment 2**

**Submission Date: 13/01/2017**

1. A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core & cladding refractive index of 1.50 % 1.47 respectively. Find (i) Critical angle and core cladding interface (ii) NA (iii) Acceptance angle.
2. Find critical angle for step index fiber with refractive index of a core is 1.46 & relative refractive index difference is 2%.
3. A multimode step index fiber has a relative index difference of 1% and core refractive index of 1.5. The number of modes propagating at a wavelength of  $1.3\mu\text{m}$  is 1100. Find diameter of core.
4. A step index fiber in air has a NA of 0.16,  $n_1=1.45$  and  $d=60\mu\text{m}$ . Find out no. of guided modes propagating at  $0.82\mu\text{m}$ .
5. Design a single mode fiber with  $V=2.3$  for operation at 1.55micron with a fused silica core  $n_1=1.458$  and  $NA=0.1$ . Find diameter of core. Also find no. of modes at operating wavelength of 1.2 micron.
6. An installed fiber has  $d=62.5\mu\text{m}$ ,  $NA=0.275$ ,  $\lambda=1310\text{nm}$ . Find no. of guided modes for parabolic refractive index profile.
7. A core with a refractive index profile  $\alpha=2$  has a diameter of  $50\mu\text{m}$ .  $NA=0.2$ , Find out total no. of modes propagating at  $1\mu\text{m}$ .
8. A multimode step index fiber has  $n_1=1.5$ ,  $n_2= 1.38$ , core diameter of  $50\mu\text{m}$  operates at  $1300\text{nm}$ . Find (i)NA, (ii)no. of modes (iii)solid acceptance angle(iv) Critical angle (v) $\Delta$

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**Assignment 3**

**Submission Date: 28/01/2017**

1. Explain in brief various losses in optical fiber.
2. Explain scattering losses.
3. Explain absorption losses in brief.
4. What is bending losses & how the bending losses can be reduced?
5. Explain the meaning and cause of dispersion. What is intermodal and intramodal dispersion
6. Explain significance of phase and group velocities in a dispersive medium.

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**Assignment 4**

**Submission Date: 10/02/2017**

1. Explain Following (i) The structure of double hetro structure LED. (ii) Surface-emitting LED with Neat sketch. (ii) Edge-emitting double-hetro junction LED.
2. What is Quantum efficiency & power of LED?
3. Compare LED with LASER.
4. Discuss three key transition processes involved in laser action
5. Explain fabry-perot resonator cavity for laser diode.
6. Explain DFB laser diode.

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**Assignment 5**

**Submission Date: 20/03/2017**

1. Derive the equations for power launched from LED source into a S.I. and G.I. fiber.
2. Justify: The optical power launched into a fiber does not depend on the wavelength of the source but only on its brightness.
3. Explain fusion, v-groove, and Elastic tube splice.
4. What are the requirements of good connector?
5. Explain the types of connectors

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**Assignment 6**

**Submission Date: 31/03/2017**

1. Explain basic principle of pin diode detector and avalanche photodiode
2. What are the requirements of an ideal photo- detector?
3. Explain basic structure of APD and types
4. Explain various types of (i)noise (ii) pre-amplifiers
5. What are the requirements of an optical receiver & explain a typical optical receiver configuration.
6. Write detailed note on eye diagram. What does a closed eye indicator?
7. Discuss the system considerations while designing an OFC system.
8. How will you calculate optical power budget? Assume data and discuss.
9. Write short note on (i) Rise time budget (ii) optical link power budget
10. Explain BER calculation
11. Discuss optical power loss model for a point to point link.

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**Assignment 7**

**Submission Date: 07/04/2017**

1. Write short note on (i) SOA (ii) Wideband amplifier (iii) RAMAN amplifier
2. Explain operation of EDFA
3. How amplification is achieved in SOA and EDFA?
4. Explain principle of WDM with its components
5. What do you mean by DWDM? Explain structure of DWDM.
6. Write short note on SONET/SDH scheme
7. Draw structure of STS- 48 and STM- 64 frame and find the data rate for both
8. Explain SONET rings. Also State advantage of BLSR over UPSR
9. What is coupler? Explain FBT coupler with its performance parameters.
10. Draw  $16 \times 16$  star couple using  $2 \times 2$  coupler.
11. Explain (i) AWG (ii) Optical isolator (iii) optical circulator (iv) OADM
12. Explain method for measurement of NA
13. Discuss Basic equipment setup for making eye pattern measurement
14. Explain(i) optical power method (ii) optical spectrum analyzer(iii) OTDR
15. Explain Time domain and frequency domain intermodal dispersion measurement.