

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2726

Roll No.

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B.Tech.

(SEM. VII) THEORY EXAMINATION 2011-12

OPTICAL COMMUNICATION

Time : 3 Hours

Total Marks : 100

Note :- (1) Attempt all questions.

(2) All questions carry equal marks.

1. Attempt any **four** parts of the following : **(5×4=20)**
- Draw the block diagram of optical fiber communication system. Enlist the advantages of optical communication.
 - What do you mean by Acceptance Angle of an optical fiber, show how it is related to refractive index of the fiber core, cladding and medium where fiber is placed ?
 - Explain following :
 - Normalized propagation constant
 - Mode field diameter
 - A graded index fiber has a core with a parabolic refractive index profile and diameter $40\mu\text{m}$. Numerical aperture is 0.2. Estimate the total number of guided modes for a wavelength of $1\mu\text{m}$.

- (e) Differentiate between meridional and skew rays. An optical fiber in air has NA 0.4; compare the acceptance angle for skew rays which changes direction by 100° at each reflection.
- (f) What do you understand by Inter Symbol Interference (ISI)? A multimode graded index fiber exhibits total pulse broadening of $0.1\mu\text{s}$ over a distance of 15 km.

Estimate :

- (i) The maximum possible bandwidth without ISI.
- (ii) Pulse dispersion per unit length.

2. Attempt any **four** parts of the following : **(5×4=20)**
- (a) Discuss the Vapor-phase oxidation technique in preparation of Low-Loss optical fiber.
- (b) What do you understand by scattering loss? Describe its types with Expressions.
- (c) Discuss various dispersion mechanisms.
- (d) Explain in brief the propagation characteristics of single and multimode fibers.
- (e) Explain the principle of semiconductor lasers and draw the emission characteristic.
- (f) A ruby laser crystal is 4cm long ($n = 1.78$). The peak emission wavelength is $0.55\mu\text{m}$. Determine the number of longitudinal modes and their frequency separation.

3. Attempt any **two** parts of the following : **(10×2=20)**

- (a) Explain the physical principle of APD. What is the temperature effect on Avalanche Gain ? Describe Automatic gain control using Op-Amp.
- (b) Explain a Digital signal transmission setup suitable for fiber optic communication.
- (c) What is the significance of intrinsic layer in PIN diode ?
What is the principle of working of PIN diode ?

4. Attempt any **two** parts of the following : **(10×2=20)**

- (a) Write short notes on the following :
 - (i) Multi channel transmission techniques
 - (ii) WDM.
- (b) (i) With the help of a neat block diagram, explain the principle of working of Point to Point digital link.
(ii) A 32×32 port multimode coupler (fiber transmissive star coupler) has 1mW of optical power Launched to a single input port. The average optical power measured for each output port is 14μW. Evaluate the total loss incurred through the device and average insertion Loss.

(c) A continuous 12 km long optical fiber link has a loss of 1.5 db/km.

(i) What is the minimum optical power level that must be launched into the fiber to maintain an optical power level of $0.3\mu\text{m}$ at the receiving end ?

(ii) What is the required input power if the fiber has a loss of 2.5db/km^2 ?

5. Attempt any **four** parts of the following : **(5×4=20)**

(a) Optical Power Budgeting.

(b) Discuss Hetro-Junction in LED Diodes.

(c) Compare and contrast Direct and Coherent detection method.

(d) Explain the working of a Heterodyne detection technique suitable for optical fiber communication.

(e) Describe the principle of Optical Power Meter.

(f) Write a short note on Noise sources in optical fiber communication.