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B TECH
(SEM-V) THEORY EXAMINATION 2020-21
OPTICAL COMMUNICATION

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Qno.	Question	Marks	CO
a.	What is acceptance angle? Why do we need to know this angle?	2	
b.	What are the advantages and disadvantages of fiber optic communications?	2	
c.	Define Numerical aperture of the fiber. Why it can't be made very large?	2	
d.	What is Rayleigh scattering?	2	
e.	Define external quantum efficiency.	2	
f.	Define skew rays and meridional rays?	2	
g.	What do you mean by pulse broadening?	2	
h.	What are the two reasons for chromatic dispersion?	2	
i.	Define – normalized frequency.	2	
j.	What are the uses of optical fibers?	2	

SECTION B**2. Attempt any three of the following:**

Qno.	Question	Marks	CO
a.	Draw a block diagram of fiber optic communication system and describe the function of each component.	10	
b.	Derive an expression for numerical aperture of a step index fiber with neat figure showing all the details.	10	
c.	Explain the following with necessary diagram and expressions (i) Non linear scattering loss and fiber bend loss. (ii) Material dispersion in optical fiber.	10	
d.	A silicon p- i-n photodiode incorporated into an optical receiver has a quantum efficiency of 60% at a wavelength of 0.9 μm . The dark current is 3 nA and load resistance is 4 K Ω . The incident optical power is 200nw and the receiver bandwidth is 5Mhz. Determine (1) mean square quantum noise current, (2) mean square dark current and (3) mean square thermal noise current at a temperature of 20°C.	10	
e.	Write short notes on any TWO of the following; 1. Point to Point Links 2. Power Penalties 3. Multichannel & Multiplexing Transmission Techniques	10	



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SECTION C

3. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Draw and explain ray theory transmission in an optical communication.	10	
b.	Differentiate between step index and Graded index fiber. How do the rays propagate in graded index fiber? Differentiate between Meridional Rays and Skew Rays.	10	

4. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Discuss material and waveguide dispersion mechanisms with necessary mathematical expressions.	10	
b.	Explain intrinsic and extrinsic absorption in optical fiber material. Write a note on polarization maintain fiber.	10	

5. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Explain the principal of LASER diode. What are the pumping techniques of LASER diode? What do you understand by the term external quantum efficiency and internal quantum efficiency?	10	
b.	What type of materials is used for optical sources? What are the advantages of double Hetro structure? Compare surface emitting and edge emitting LED structures.	10	

6. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	What are the two major requirement of a pre-amplifier in optical receiver? Explain how these are achieved in a trans impedance amplifier	10	
b.	Explain avalanche photo diode and explain effect of temperature on avalanche gain.	10	

7. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Draw and explain the operation of Optical receiver.	10	
b.	What are the advantages of a coherent optical communication system? Explain the principle of heterodyne detection used in optical systems.	10	