Course Name:OPTICAL FIBRE COMMUNICATION (EC- 702)

Course Outcome:

At the end of the course, the student should be able to:

1. Realize basic elements in optical fibers, different modes and configurations.
2. Analyze the transmission characteristics associated with dispersion and polarization techniques.
3. Design optical sources and detectors with their use in optical communication system.
4. Construct fiber optic receiver systems, measurements and coupling techniques.
5. Design optical communication systems and its networks.

MODEL QUESTION PAPER

S.No.	Questions	Marks	CO	BL
1a	Draw and discuss the basic block diagram of a fiber optic communication system. Why are optical fibers so good for communications?	6	1	3
1b	What are the functions of the core and cladding in an optical fiber? Why should their refractive indices be different?	6	1	2
1c	What is dispersion? Explain different types of dispersion? Why single modal fiber is used in the commercial communication system	8	2	2
2a	Define the relative refractive index difference for an Optical fiber and show how it may be related to the numerical aperture.	10	1	4
2b	What is the difference between Step index fiber and Graded index fiber? A Step index silicon fiber has core index of 1.48 and cladding RI of 1.47,calculate a) Critical angle b) NA of the fiber c) Acceptance angle assuming the external medium to be air.	10	1	4
3a	What do you understand by Attenuation. What are the different types of scattering losses inside an optical fiber?	6	2	1
3b	Explain about intrinsic and extrinsic absorption exists in optical fibers	6	2	2
3c	Differentiate between semiconductor laser and light emitting diode.	8	3	4
4a	Derive the expression for maximum pulse broadening due to intermodal dispersion in multimode fiber	10	2	5

4b	What are intermodal and intramodal dispersion? For the given following parameters, calculate attenuation and Rayleigh scattering coefficient for a fiber. a. Fictive temperature = 1350k b. Isothermal compressibility B c = 7.25 * 10 11 m 2 N -1 c. Average photo elastic coefficient = 0.286 d. Refractive index (n 1) = 1.46 e. Length L = 1Km and λ =1.30 μm.	10	2	4
5a	What is distributed feedback laser? What are its advantages?	6	3	1
5b	Explain receiver sensitivity. How it is related to BER.	6	3	2
5c	Explain p-i-n photodiode in detail. What is the main advantage of p-i-n photodiode over p-n photodiode?	8	3	
6a	Draw and explain double hetero structure configuration. Why it required for optical communication.	10	3	3
6b	Explain with neat diagram the basic principle of photo detection in an optical system. The Quantum efficiency of a RAPD is 70% for the detection of radiation at 0.9μm, when incident optical power is 0.8μw.The output current from the device (after avalanche gain) is 12 μA. Determine avalanche multiplication factor?	10	3	3
7a	Discuss the principles and requirements of WDM. List out the WDM components. Explain them briefly.	6	5	1
7b	Draw the architecture of OADM?	6	5	3
7c	Describe in detail about Rise time Budget of Optical Fiber Communication in-terms of digital system design.	8	4	1
8a	An engineer has the following components available: (a) GaAlAs laser diode operating at 850 nm and capable of coupling 1 mW (0 dBm) into a fi ber. (b) Ten sections of cable each of which is 500 m long, has a 4-dB/km attenuation, and has connectors on both ends. (c) Connector loss of 2 dB/connector. (d) A pin photodiode receiver. (e) An avalanche photodiode receiver. Using these components, the engineer wishes to construct a 5-km link operating at 20 Mb/s. If the sensitivities of the pin and APD receivers are –45 and –56 dBm, respectively, which receiver should be	10	4	5

	used if a 6-dB system operating margin is required?			
8b	Describe the principle and working of SONET also brief SONET/SDH Overheads in network	10	5	2

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3- Applying, 4- Analysing, 5- Evaluating, 6- Creating)

CO – Course Outcomes

PO – Program Outcomes;