Name: Enrolment No:	

UPES

End Semester Examination, December 2023

Course: Optical Fiber Communications **Semester: 7**
Program: B. Tech (ECE) **Time: 03 hrs.**
Course Code: ECEG 4053P **Max. Marks: 100**

Instructions: The diagram must be neat and clear

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Give the operation of optical receiver with a proper schematic diagram.	**4**	**CO1**
Q 2	Mention the polarization dispersion in respect of optical fiber communication.	**4**	**CO1**
Q 3	Determine the optical power in dBm and dBμ for the given power levels (i) 20 mW (ii) 10 μW	**4**	**CO2**
Q 4	Discuss the Mach-Zehnder interferometer multiplexer in respect of wavelength division multiplexing.	**4**	**CO3**
Q 5	Define optical circulator and explain it with a proper schematic diagram.	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Draw the block diagram of an optical fiber communication system and explain each block in detail.	**10**	**CO1**
Q 7	Describe non-linear scattering losses in optical fibers with regard to: (i) Stimulated Brillouin Scattering (ii) Stimulated Raman Scattering	**10**	**CO2**
Q 8	Mention the different types of optical amplifier. Discuss semiconductor optical amplifier along with citing its advantages and disadvantages.	**10**	**CO3**
Q 9	Explain the following in respect of digital link: (i) Point-to-point links (ii) Power penalties	**10**	**CO4**

SECTION-C (2Qx20M=40 Marks)			
Q 10	a) An optical fiber, operating at 2nd window of the optical band, has refractive indices of core and cladding materials are 1.40 and 1.37 respectively. The radius of the core and cladding are 25μm and 125μm respectively. Determine the following for this case: (i) Critical angle. (ii) Numerical aperture. (iii) Acceptance angle. (iv) Operating frequency. (v) Number of modes. a) The radiative and non-radiative recombination lifetimes of minority carriers in the active region of a double heterojunction LED are 60 nsec and 90 nsec respectively. Determine the total carrier recombination lifetime and optical power generated internally if the peak emission wavelength of Silicon is 870 nm and the drive current is 40 mA.	**10+10**	**CO1** **CO1**
Q 11	a) The mean optical power launched into a 10 km length of fiber is 120 μW and the mean optical power at the output is 3 μW. Calculate: (i) The overall signal attenuation in dB without connectors or splices. (ii) The signal attenuation per kilometer for the fiber. (iii) The overall signal attenuation for 8 km optical link using the same fiber with splices at 1 km intervals, each giving attenuation of 1 dB. (iv) The numerical input/output ratio of (iii) b) In a fiber link the laser diode output power is 5 dBm, source-fiber coupling loss of 3 dB, connector loss of 2 dB, and has 50 splices of 0.1 dB loss. Fiber attenuation loss for 100 km is 25 dB, compute the loss margin for APD receiver with sensitivity	**10+10**	**CO2** **CO4**