Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Fiber Optic Communications
Semester: VI
Program: B.Tech. ECE **Time 03 hrs.**
Course Code: ECEG 3040 **Max. Marks: 100**

Instructions: All diagrams are to be drawn by pencil.

SECTION A **5Qx4 = 20**
Answers all Questions

S. No.		Marks	CO
1.	A step index fiber has normalized frequency 25 and at 1300 nm wavelength. If the core radius is 25μm, determine the numerical aperture.	**4**	**CO1**
2.	Determine the phase change when the light ray gets totally internally reflected with the refractive index n=1.0 and incident angle is 45^0.	**4**	**CO2**
3.	Write about classification of Fiber optic sensors in the field of instrumentation.	**4**	**CO3**
4.	A trigonometrical measurement is performed in order to determine the numerical aperture of a step index fiber. The screen is positioned 10.0cm from the fiber end face. When illuminated from a w ide angled visible source the measured output pattern size is 6.2 cm. Calculate the approximate numerical aperture of the fiber.	**4**	**CO3**
5.	Write about SDH architecture in the Optical fiber Network.	**4**	**CO4**
	SECTION B	**4Qx10= 40**	
6.	(a)Determine the maximum possible core radius allowed for a glass fiber having n_1=1.465 and n_2=1.46 if the waveguide is to support only one mode at a wavelength of 1250nm? (b) Explain in the terms Intermodal and Intramodal dispersion in waveguides	**6+4**	**CO1**
7.	A 2 km length of multimode fiber is attached to apparatus for spectral loss measurement. The measured output voltage from the photo-receiver using the full 2 km fiber length is 2.1V at a wavelength of 0.85μm. When the fiber is then cut back to leave a 3 m length the output voltage increases to 10.5 V. Determine the	**10**	**CO3**

	attenuation per kilometer for the fiber at a wavelength of 0.85μm and estimate the accuracy of the result		
8.	a) GaAs has a bandgap energy of 1.43 eV at 300 K. Determine the wavelength above which an intrinsic photodetector fabricated from this material will cease to operate (b)Describe the structure of edge emitting semiconductor light emitting diode.	**6+4**	**CO3**
9.	a)Explain different Splicing techniques with neat sketch.	**10**	**CO4**
	SECTION-C **Write any two questions**		**2Qx20=40**
10.	(a)A glass fiber exhibits material dispersion given by $[\lambda^2 (d^2n_1/d\lambda^2)]$ of 0.02 5. Determine. the material dispersion parameter at a wavelength of 0.85 μm. and estimate the rms pulse broadening per kilometer for a good LED source with an rms spectral width of 20 nm at this wavelength. b)Describe the working Fabry Perot cavity sensor which measures strain or force .	**12+8**	**CO3**
11.	(a) Two step index fibers have the following characteristics: A core refractive index of 1.500 with a relative refractive index difference of 0.2% and an operating wavelength of 1.55 μm. A core refractive index the same as (a) but a relative refractive index difference of 3% and an operating wavelength of 0. 82 μm. Estimate the critical radius of curvature at which large bending losses occur in both cases. (b) Describe the amplification process of Erbium Doped Fiber Amplifiers. . (OR) (c) A silicon *p-i-n* photodiode incorporated into an optical receiver has a quantum efficiency of 60% when operating at a wavelength of 0.9μm. The dark current in the device at this operating point is 3 nA and the load resistance is 4 kΩ. The incident	**14+6**	**CO4**

	optical power at this wavelength is 200 mW and the post detection bandwidth of the receiver is 5 MHz. Compare the shot noise generated in the photodiode with the thermal noise in the load resistor at a temperature of 20 °C. (d) Describe the structure of Distributed feedback LASER		