Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Mid Semester Examination, May 2021

Programme Name: B.Tech ECE **Semester** : VI
Course Name : Fiber Optic Communications **Time** : 03 hrs
Course Code : ECEG 3040 **Max. Marks** : 100
Nos. of page(s) : 2

Instructions:

- **Attempt all questions as per the instruction**
- **Assume any data if required and indicate the same clearly.**
- **Unless otherwise indicated symbols and notations have their usual meanings.**
- **Strike off all unused blank pages**

SECTION A **6x 5=30**

Write only answer in the text box(for S.No:2&3 write ONLY the final answer)

S. No.	Question	Marks	CO
Q1.	Explain Signal distortion in optical fibers due to attenuation and absorption.	5	CO1
Q2.	A step index fiber has normalized frequency 25 and at an 1100 nm wavelength. If the core radius is 25μm, determine the numerical aperture	5	CO1
Q3.	A multimode graded index fiber exhibits total pulse broadening of 0.1 μS over a distance of 15 km. Estimate the pulse dispersion per unit length.	5	CO2
Q4.	What is the basic difference between LASER and LED as a source in the terms of efficiency?	5	CO2
Q5.	Write about four Amplifier Types and Applications in Fiber optics.	5	CO3
Q6.	Write about classification of Fiber optic sensors in the field of instrumentation.	5	CO4

SECTION B **5x10=50**

Q7.	a)Explain three windows of optical communication through the graph representing wavelength Vs attenuation. b)Illustrate the SONET architecture.	7+3	CO1

Q8.	A graded index fiber with a parabolic refractive index profile core has a refractive index at the core axis of 1.7 and a relative index difference of 1 %. Estimate the maximum possible core diameter which allows single mode operation at a wavelength of 1.3μm.	10	**CO2**
Q9.	a)Explain different Splicing techniques with neat sketch. b)Draw and explain the output patterns of source to fiber power launching	10	**CO3**
Q10.	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 attenuation per kilometer for the fiber at a wavelength of 0.85μm and estimate the accuracy of the result	10	**CO3**
Q11.	Write about implementation of WDM in optical communications in the two windows of wavelengths 1310and 850 nm.	10	**CO4**
	SECTION C		**5x10=50**
Q12.	(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 structure of Find 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 optical power at this wavelength is 200 nmW 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)Design of Cavity Sensor as a inferometer that uses the principle of mirrors to determine the pressure, in the field of instrumentation.	10+10	**CO4**