B.E. Electronics & Communication/Telecommunication Engineering (Model Curriculum)
Semester-VII
ET701M - Fiber Optic Communications

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Notes : 1.   All questions carry marks as indicated.
2.   Assume suitable data wherever necessary.
3.   Illustrate your answers wherever necessary with the help of neat sketches.

1. a)   Draw and explain the block diagram of fiber optics communication system? State the advantages and disadvantages of fiber optics communication.   **8**

b)   A graded index fiber with a parabolic refractive index profile core has a refractive index at the core of 1.5 and a relative index difference of 1%. Estimate the maximum possible core diameter which allows single mode operation at a wavelength of $1.3\,\mu m$.   **8**

OR

2. a)   What is graded index fiber? Prove that.   **8**

$$Mg = \frac{V^2}{4}$$

b)   Define.   **8**

i)   Refraction
ii)   Refraction Index.
iii)   Absolute refractive index.
iv)   Relative refractive index also state the significance of refractive index.

3. a)   Explain different types of optical fiber joint losses.   **8**

b)   When the mean optical power launched into an 8km length of fiber is $120\,\mu m$. The mean optical power at the fiber output is $3\,\mu m$. Determine.   **8**

i)   The overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices.
ii)   The signal attenuation per kilometer for the fiber.
iii) The overall signal attenuation for a 10km optical link using the same fiber with splices at 1km intervals, each giving an attenuation of 1dB.
iv)   The numerical input/ output power ratio in (iii).

OR

4. a)   What is dispersion? Derive an expression of waveguide dispersion. What do you mean by pulse broadening? Explain its effect on information carrying capacity of a fiber.   **8**

b)   Explain ferrule type and expanded beam optical connector.   **8**

5.	a)	With the help of a neat diagram explain the construction and working of an edge emitting LED?	**8**
	b)	What is population inversion? Explain population inversion with three level and four level energy band diagram.	**8**

<div align="center">OR</div>

6.	a)	Explain the operating principle of LASER with the help of energy band diagram.	**8**
	b)	A planar LED is fabricated from gallium arsenide which has a refractive index of 3.6. a) Calculate the optical power emitted into air as a percentage of the internal optical power for the device when the transmission factor at the crystal-air interface is 0.68. b) When the optical power generated internally is 50% of the electric power supplied, determine the external power efficiency.	**8**
7.	a)	What are the characteristics of photodetector explain in details.	**8**
	b)	A photodiode has a quantum efficiency of 65% when photons of energy $1.5 \times 10\text{-}19$ J are incident upon it. a) At what wavelength is the photodiode operating? b) Calculate the incident optical power required to obtain a photocurrent of 2.5 μA when the photodiode is operating as described above.	**8**

<div align="center">OR</div>

8.	a)	Draw the structures of APD photo detectors and explain their operations.	**8**
	b)	Define.	**8**

i)	Thermal noise.	ii)	Dark current noise.
iii)	Quantum Noise.	iv)	Quantum efficiency.

9.	a)	Define.	**8**

i)	Network topology.	ii)	Networking nodes.
iii)	Network switching nodes.	iv)	Virtual circuits.

	b)	Define STM and state their units with bitrates. Also draw and explain the frame format of STM-1.	**8**

<div align="center">OR</div>

10.	a)	With the help of neat block diagram explain elements of GPON.	**8**
	b)	What is SDH? Explain the network elements of SDH with schematic diagram.	**8**

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