

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

P. Pages : 2

Time : Three Hours



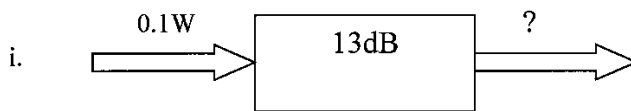
GUG/W/24/14247

Max. Marks : 80

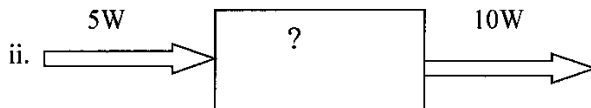
- Notes :
1. All questions carry marks as indicated.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answers wherever necessary with the help of neat sketches.

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

- B) 1) Consider the following network. 8



What is output power in watts?



What is the gain of network in dB?

- ii) An amplifier has an output of 20W, what is its output in dBm

OR

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

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

- B) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and cladding refractive index of 1.47. Determine. 8
- i) The critical angle of the core cladding interface.
 - ii) The numerical aperture for fiber.
 - iii) The acceptance angle in air for the fiber.

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

- B) What is dispersion? Explain waveguide dispersion with mathematical expression also explain how to minimize dispersion. 8

OR

4. A) What is fiber connector? Explain requirement of good connectors. Explain ferrule type optical connector. 8
- B) What is splicing. Explain Fusion splicing techniques in details. 8
5. A) The radiative and nonradiative recombination lifetime of the minority carriers in the active region of a double-heterojunction LED are 60 ns and 100 ns respectively. Determine the total carrier recombination lifetime and the power internally generated within the device when the peak emission wavelength is $0.87\text{ }\mu\text{m}$ at a drive current of 40 mA. 8
- B) What is LASER? Explain working principle of LASER with their energy band diagram. 8
- OR**
6. A) What is quantum efficiency? Explain operation of double heterojunction LED. 8
- B) Compare 8
- 1) Direct band gap and indirect band gap material.
 - 2) Surface emitting and edge emitting LED.
7. A) What is optical amplifier? Explain Erbium doped fiber amplifier? 8
- B) A silicon pin photodiode has an intrinsic region with a width of $20\text{ }\mu\text{m}$ and a diameter of $500\text{ }\mu\text{m}$ in which the drift velocity of electrons is $10.5 \times 10^{-13}\text{ F cm}^{-1}$. Calculate 8
- a) Drift time of the carriers across the depletion region.
 - b) Junction capacitance of the photodiode.
- OR**
8. A) Draw the structures of APD photo detectors and explain their operations. 8
- B) A photodiode has a quantum efficiency of 65% when photons of energy $1.5 \times 10^{-19}\text{ J}$ are incident upon it. 8
- a) At what wavelength is the photodiode operating?
 - b) Calculate the incident optical power required to obtain a photocurrent of $2.5\text{ }\mu\text{A}$ when the photodiode is operating as described above.
9. A) Explain experimental arrangement for the measurement of spectral loss in optical fibers using the cut-back technique. 8
- B) Define STM and state their units with bitrates. Also draw and explain the frame format of STM-1. 8
- OR**
10. A) Why GPON network is widely used explain with neat block diagram. State the features of GPON. 8
- B) Define DWDM. Discuss the concept of DWDM with neat diagram. State the features of DWDM. 8
