



Name :

Roll No. :

Invigilator's Signature :

CS/M.TECH(ECE-OLD)/SEM-2/MC-203/2012

2012

LIGHT WAVE TECHNOLOGY FOR COMMUNICATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Objective Type Questions)

1. Answer any *five* questions : $5 \times 2 = 10$
- i) What is the V no. of a fibre ?
 - ii) What is a Q-factor of a linear cavity ?
 - iii) Why cladding should have lower refractive index than the core of optical fibre ?
 - iv) Why crosstalk occur in a WDM system ?
 - v) What are the causes of attenuation in optical fibres ?
 - vi) What is the difference between electrical bandwidth and optical bandwidth ?
 - vii) What is the scientific meaning of the term monochromatism ?



GROUP – B

(Long Answer Type Questions)

Answer any *four* questions.

$4 \times 15 = 60$

2. a) What are the advantages of optical fibre cable over co-axial cable ?
- b) What is meant by acceptance angle for an optical fibre ?
- c) Show how this is related to numerical aperture in case of a graded index fibre.
- d) A silica optical fibre with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47.

Determine :

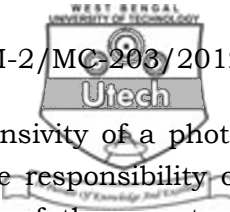
- i) The critical angle at the core-cladding interface
- ii) The numerical aperture (NA) for the fiber
- iii) The acceptance angle in air for the fibre.

$3 + 2 + 4 + 6$

3. a) Draw the basic architecture of erbium-doped fibre amplifier (EDFA) and find its power conversion efficiency and gain.
- b) Discuss any one topology for multihop light wave networks.
4. a) Explain the operational principles of WDM.
- b) With suitable diagram discuss the concept of 2×2 fibre optic coupler and define the terms coupling co-efficient, coupling ratio, excess loss, insertion loss and return loss.
5. a) Explain the working principle for $p-n$ junction photodiode. Compare this device with $p-i-n$ photodiode.

$4 + 6 + 5$

$5 + 5 + 5$



- b) Define Quantum efficiency and responsivity of a photo detector. Derive an expression for the responsivity of an intrinsic photo detector in terms of the quantum efficiency of the device and the wavelength of the incident radiation.
- c) GaAs has band gap energy of 1.43 eV at 300 K. Determine the wavelength above, which an intrinsic photo detector fabricated from this material, will cease to operate. $(4 + 3) + (2 + 3) + 3$
6. a) With suitable block diagram explain the working principle of an optical receiver.
- b) What are the design criteria of a front-end amplifier for the above receiver ?
- c) What are the different error sources that causes the bit error in optical fibre communication ? Define bit error rate (BER). $6 + 4 + 4 + 1$
7. Write short notes on any *three* of the following : 3×5
- a) Fibre Bragg grating
- b) Optical Power budget
- c) SONET/SDH
- d) Optical Isolator.

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