TED (21) 5043A

(Revision-2021)

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# DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL – 2025

## OPTICAL COMMUNICATION AND NETWORKING

[Maximum marks: 75]                                                                 [Time: 3 Hours]

### PART A

**I. Answer all the following questions in one word or one sentence. Each question carries 1 mark**

**(9 x 1 = 9 Marks)**

|   |   | Module outcome | Cognitive level |
|---|---|---|---|
| 1 | List the fiber modes based on refractive index profile. | M1.03 | R |
| 2 | If a light ray is incident on glass-air interface with an angle of incidence $25^0$ and angle of refraction $32^0$, calculate the refractive index of glass. | M1.01 | A |
| 3 | Define Population inversion. | M2.01 | R |
| 4 | List any two optical detectors. | M2.03 | R |
| 5 | State any one difference between PIN diode and Avalanche diode. | M2.04 | R |
| 6 | Name any two optical amplifiers. | M3.01 | R |
| 7 | State the basic cause for scattering loss in optical fiber. | M3.02 | R |
| 8 | Write the function of an optical isolator. | M4.02 | R |
| 9 | State the expanded form of SDH. | M4.04 | R |

### PART B

**II. Answer any eight questions from the following. Each question carries 3 marks.**

**(8 x 3 = 24 Marks)**

|   |   | Module outcome | Cognitive level |
|---|---|---|---|
| 1 | Explain Total Internal Reflection in an optical fiber with diagram. | M1.01 | U |
| 2 | Speed of light in water is reduced by a factor of 1.3 compared to the speed of light in air. Calculate the speed of light in water (Speed of light in air = $3 \times 10^8$ m/s) | M1.01 | A |
| 3 | Define refraction of light. State Snell's law for refraction of light and also express it mathematically. | M1.01 | R |
| 4 | Explain Multimode and Single mode fibers with figure. | M1.03 | U |
| 5 | Draw the structure of a laser diode. | M2.01 | R |
| 6 | Outline the block diagram of an optical receiver. | M3.03 | U |
| 7 | Draw the functional diagram of a circulator. | M4.02 | R |

| 8 | State the function of the following optical elements in one sentence.<br><br>    (i)      Optical coupler<br>    (ii)     Beam splitter  (iii) Optical modulator. | M4.02 | R |
|---|---|---|---|
| 9 | Outline a Wavelength Routed Network. | M4.04 | U |
| 10 | Explain SONET. | M4.04 | U |

## PART C
### Answer all questions. Each question carries seven marks
**(6 x 7 = 42 Marks)**

| | | Module outcome | Cognitive level |
|---|---|---|---|
| III | Explain numerical aperture, acceptance angle and refractive index with mathematical expressions. | M1.02 | U |
| | **OR** | | |
| IV | Explain any five advantages of optical fiber. | M1.03 | U |
| V | Explain the theory of LASER action with energy band diagrams. | M2.01 | U |
| | **OR** | | |
| VI | Explain the principle of operation of LED with energy band diagram. | M2.01 | U |
| VII | Outline the structure of a Surface Emitting LED. | M2.01 | U |
| | **OR** | | |
| VIII | Illustrate the working principle of an Avalanche Photo Diode. | M2.04 | U |
| IX | Describe the working of EDFA with diagram. | M3.01 | U |
| | **OR** | | |
| X | Explain Wavelength Division Multiplexing with diagram. Mention the significance of DWDM in optical communication. | M3.04 | U |
| XI | Explain intra and inter mode dispersion losses in Optical fibers. | M3.02 | U |
| | **OR** | | |
| XII | Outline the block diagram of an optical transceiver. | M3.03 | U |
| XIII | Outline the Basic concepts in optical networking. | M4.03 | U |
| | **OR** | | |
| XIV | Describe a Broadcast-and-select Network with diagram. | M4.04 | U |

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