**20EI702/PE**

**Hall Ticket Number:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IV/IV B.Tech (Regular) DEGREE EXAMINATION** | | | | |
| **January, 2024** | | **Electronics and Instrumentation Engineering** | | |
| **Seventh Semester** | **Optoelectronics and Laser Instrumentation** | | | |
| **Time:** Three Hours | | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | | **(4X14=56 Marks)** |
|  | | | |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | CO | BL | M |
| 1 | a) | What is acceptance angle? | CO1 | L1 | 1M |
|  | b) | What is the difference between single mode fiber and multi-mode fiber? | CO1 | L2 | 1M |
|  | c) | Write the expression for refractive index in graded index fiber. | CO1 | L2 | 1M |
|  | d) | Mention the application of fiber optic sensors. | CO1 | L2 | 1M |
|  | e) | Generalize the properties of LASER. | CO2 | L2 | 1M |
|  | f) | Why population inversion is significant in lasers? | CO2 | L1 | 1M |
|  | g) | Mention the important semiconductors used in laser and LEDs. | CO2 | L1 | 1M |
|  | h) | What are the typical wavelengths of emission in a He-Ne laser? | CO2 | L1 | 1M |
|  | i) | Write the differences between extrinsic and intrinsic fiber optic sensors. | CO3 | L2 | 1M |
|  | j) | Mention the advantages of fiber optic sensors. | CO3 | L2 | 1M |
|  | k) | Explain the measurement of strain using fiber optic sensor. | CO3 | L2 | 1M |
|  | l) | What is Responsivity of an optical detector? | CO4 | L1 | 1M |
|  | m) | What is the principle of magneto-optic modulator? | CO4 | L2 | 1M |
|  | n) | What is the significance of intrinsic material in PIN photo diode? | CO4 | L2 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Estimate the expressions for NA in terms of acceptance angle of meridional ray and skew ray | CO1 | L3 | 7M |
|  | b) | Solve for the given condition, the Numerical Aperture of a fiber having n1 = 1.6 and n2 = 1.49 and another fiber having n1 = 1.458 and n2 = 1.405. Which fiber has greater acceptance angle? | CO1 | L3 | 7M |
| **(OR)** | | | | | |
| 3 | a) | Illustrate in detail about Scattering losses and bending losses | CO1 | L2 | 14M |
| **Unit-II** | | | | | |
| 4 | a) | Explain the operation of edge emitting double – hetero junction LED, with a neat schematic diagram | CO2 | L2 | 7M |
|  | b) | Derive the expression for internal quantum efficiency of LED and an expression for power generated internally in LED. | CO2 | L3 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Classify the different types of lasers. | CO2 | L2 | 7M |
|  | b) | Explain the LASER for measurement of distance and velocity. | CO2 | L3 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Examine the different types of Fiber optic sensor. | CO3 | L2 | 14M |
| **(OR)** | | | | | |
| 7 | a) | Explain in detail about Dispersion measurement techniques with neat diagram. | CO3 | L3 | 14M |
| **Unit-IV** | | | | | |
| 8 | a) | Explain p-i-n photo detector with neat sketch. | CO4 | L2 | 7M |
|  | b) | Explain how temperature effects on Avalanche gain in a p-i-n diode. | CO4 | L3 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Compare different photo detectors. | CO4 | L4 | 7M |
|  | b) | A PIN diode is characterized by a quantum efficiency of 72% at a wavelength of 900 nm. Calculate: (i) Responsivity of the PIN diode at 900 nm. (ii) Received optical power if the mean photo current is 10 mA at 900 nm. (iii) Number of received photons for 1 mA mean photo generated current. | CO4 | L3 | 7M |

