**14EI704**

**Hall Ticket Number:**

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| **IV/IV B. Tech (Regular / Supplementary) DEGREE EXAMINATION** | | | | | | | | |
| **Jan/Feb , 2021** | | | **Electronics & Instrumentation Engineering** | | | | | |
| **Seventh Semester** | | | **Optoelectronics &Laser Instrumentation** | | | | | |
| **Time:** Three Hours | | | | **Maximum :** 60 Marks | | | | |
| *Answer ALL Questions from PART-A.* | | | | | (1X12 = 12 Marks) | | | |
| *Answer* ***ANY FOUR*** *questions from PART-B.* | | | | | (4X12=48 Marks) | | | |
| **Part - A** | | | | | | | | |
| 1 | Answer all questions | | | | | (1X12=12 Marks) | |
|  | a) | What is meant by critical angle | | | | |  |
|  | b) | Distinguish between meridional rays and skew-rays | | | | |  |
|  | c) | What is the significance of dispersion in optical fibers? | | | | |  |
|  | d) | What is meant by population inversion | | | | |  |
|  | e) | A low power He-Ne laser with optical output ~5mW, operates under a DC voltage source ~2500V and I = 10mA. Estimate the overall power efficiency of the laser. | | | | |  |
|  | f) | Define mode locking of lasers | | | | |  |
|  | g) | List any two bio-medical applications of Lasers | | | | |  |
|  | h) | Define internal quantum efficiency of LED. | | | | |  |
|  | i) | What is meant by phase modulated fiber optic sensors? | | | | |  |
|  | j) | What are the desirable characteristics of optical sources? | | | | |  |
|  | k) | What is the necessity of modulators in optical fibers. | | | | |  |
|  | l) | List the applications of polarization maintaining fibers | | | | |  |
| **Part - B** | | | | | | | |
| 2 | a) | Classify basic attenuation mechanisms in an optical fiber? Discuss any two of them in detail. | | | | | 8M |
|  | b) | A graded index fiber with a parabolic refractive index profile core has a refractive index at the core axis of 1.5 & a relative index difference of 1%. Estimate the maximum possible core diameter which allows single mode operation at a wavelength of 1.3µm. | | | | | 4M |
|  | | | | | | | |
| 3 | a) | What is dispersion in an optical fiber? How does it affect the communication link? Compare single mode and multi mode fibers in this regard in detail. | | | | | 8M |
|  | b) | A 15km optical fiber link uses fiber with a loss of 1.5dB/km. The fiber is jointed every km with connectors which give an attenuation of 0.8dB each. Evaluate the minimum mean optical power which must be launched into the fiber in order to maintain a mean optical power level of 0.3µw at the detector. | | | | | 4M |
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| 4 | a) | Distinguish between the spontaneous and stimulated emissions. Which one is necessary for laser action and why? | | | | | 6M |
|  | b) | Illustrate the principle and operation of laser doppler velocity meter. | | | | | 6M |
|  | | | | | | | |
| 5 | a) | Define holography. Illustrate the holography recording and reconstruction processes. Also mention the applications of holography | | | | | 8M |
|  | b) | Outline various industrial applications of lasers? | | | | | 4M |
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| 6 | a) | With a neat diagram explain the principle and operation of fiber optic sensor used for liquid level measurement | | | | | 6M |
|  | b) | Illustrate the operation of Mach-Zehnder interferometric fiber optic sensor used for strain and force measurements | | | | | 6M |
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| 7 | a) | Outline the operation of surface emitter LED and edge emitter LED with neat diagrams | | | | | 8M |
|  | b) | Explain optical displacement sensor with neat diagram? | | | | | 4M |
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| 8 | a) | Compare the merits and demerits of p-i-n and reach through avalanche photo diodes. | | | | | 6M |
|  | b) | Explain in detail about semiconductor photo diodes without internal gain? | | | | | 6M |
|  | | | | | | | |
| 9 | a) | Illustrate the operation of Acoustic and magneto optic modulators with neat diagrams | | | | | 8M |
|  | b) | Discuss about constructional features of various types of polarization maintaining fibers | | | | | 4M |

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