CLASS: M.TECH   SEMESTER : II
BRANCH: ECE   SESSION : SP/19

SUBJECT: EC572 OPTOELECTRONIC INSTRUMENTATION

TIME: 3.00 Hrs.   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)   What are the advantages of heterojunctions for the fabrication of optical sources? Explain with diagram   [5]
         the working principle of surface emitting type DH structure LED and define its quantum efficiency.
Q.1(b)   A Si APD photodetector has a quantum efficiency of 60% at an operating wavelength of 850nm. When   [5]
         the incident optical power is 0.75µW, it produces a photocurrent of 12µA. Estimate the responsivity and
         the multiplication factor of the photodiode.

Q.2(a)   Write down the characteristics of optoelectronic couplers. Explain how a LED-phototransistor   [5]
         optoelectronic isolator circuit can be used to drive a TTL gate.
Q.2(b)   Define Bragg wavelength? Explain how fiber Bragg grating (FBG) sensors can be used for temperature   [5]
         and strain measurement?

Q.3(a)   Distinguish between Q-switching and mode locking in laser devices. Explain with diagram how Q-   [5]
         switched laser pulse can be generated using electro-optic modulator.
Q.3(b)   Write down the advantages of optical probe in profileometer. Explain with diagram the surface profile   [5]
         measurement system using vibrating pin hole.

Q.4(a)   What is laser lithotripsy? Draw an experimental set up for the spectral analysis of kidney stones and   [5]
         explain how the chemical composition of stone can be determined for optimum laser condition.
Q.4(b)   Justify the need of cross-correlation LIDAR technique for day time atmospheric measurements. Describe   [5]
         the technique with time dependent signals and spectral distribution recorded in the detectors to
         determine the air pollution map.

Q.5(a)   Explain the holographic recording process. Describe a double exposure holographic interferometry for   [5]
         analysis of object deformation.
Q.5(b)   Explain how in-line-object deformation can be measured using speckle pattern based on Young Fringe   [5]
         method.

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