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Code NO.: 16109 N(G)

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (CBCS) VI-Semester Main Examinations, May, 2019

Introduction to Optoelectronics
 (Open Elective-VI)

Time: 2 hours

Max. Marks: 50

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Q.No.	Stem of the question	M	L	CO	PO
Part-A (5 × 2 = 10 Marks)					
1.	When a light beam of wavelength 620 nm is incident on a photodiode of 50% quantum efficiency, the photocurrent generated is 2 μA. What is the incident optical power?	2	3	1	1,2,12
2.	What is homo junction and hetero junction laser?	2	2	1	1,2,12
3.	Mention the advantages of LED over conventional sources.	2	2	2	1,2,12
4.	List various types of OLED.	2	1	2	1,2,12
5.	Write down any four applications of solar cells.	2	2	2	1,2,12
Part-B (5 × 8 = 40 Marks)					
6.a)	Explain the construction and working of Avalanche photo diode (APD).	5	2	1	1,2,12
b)	A particular InGaAs photodiode with an AR coating (designed for 1240 nm) has a responsivity of 0.2 A/W at 1240nm. Given that the absorption coefficient of InGaAs at 1240 nm is 10 ⁴ /cm, and the thickness of the material is 1 μm. What percentage of the generated carriers will contribute to the photocurrent in the external circuit?	3	3	1	1,2,12
7.a)	Sketch typical illumination characteristics for a photodiode and explain the theory of the device.	5	2	1	1,2,12
b)	A photo diode has a quantum efficiency of 65% when photons of energy 1.5×10 ⁻¹⁹ J are incident upon it. i) At what wave length the photo diode is operating. ii) Calculate the incident optical power required to obtain a photocurrent of 2.5μA when the photo diode is operating as described above.	3	3	1	1,2,12
8.a)	Mention the characteristics of laser beam.	2	2	1	1,2,12
b)	Describe the construction and working of laser diode.	6	2	1	1,2,12
9.a)	Illustrate the principle, construction and working of LED with suitable diagrams.	6	3	2	1,2,12
b)	What are the main requirements for suitable LED materials?	2	2	2	1,2,12
10.a)	Expand OLED. Describe its structure with the help of neat sketch.	5	2	2	1,2,12
b)	Differentiate between photo conductive mode and photo voltaic mode.	3	2	2	1,2,12

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11. a)	What is Solar cell? Explain the working principle and construction of solar cell.	5	2	2	1,2,12
b)	A solar cell having fill factor 0.6 gives the maximum power output of 18×10^{-3} W. Calculate its I_{sc} and efficiency.	3	3	2	1,2,12
12. a)	Write down the differences between direct and indirect band gap semiconductors with suitable examples.	4	3	1	1,2,12
b)	With the help of useful sketch describe SLED and ELED.	4	2	2	1,2,12

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	64%
2	Knowledge on application and analysis (Level-3 & 4)	36%
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	-

