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Unit 10 - Week 9

Week 9 Assignment 9

1) For a Photo-diode, which of the following statement is TRUE? *2 points*

- (a) The reverse saturation current is a function of light falling on the junction.
- (b) The reverse saturation current is a function of the temperature of the junction.
- (c) The reverse saturation current is a function of both light falling on the junction and the junction temperature.
- (d) The reverse saturation current is independent of both light falling on the junction and the junction temperature.

Accepted Answers:
(c) The reverse saturation current is a function of both light falling on the junction and the junction temperature.

2) *2 points*

Photons of energy 1.58×10^{-19} J are incident on a photodiode which has responsivity 0.69 A/W. The optical power level of the diode is 10 microW. Determine the reverse saturation current generated.

- (a) 6.9 microA
- (b) 3.45 microA
- (c) 13.8 microA
- (d) 0 microA

Accepted Answers:
(a) 6.9 microA

3) *2 points*

A photo-detector as an active area of 20 mm^2 and a responsivity of 0.5 A/W. It illuminated by light of intensity 1 mW/cm^2. A voltage output is obtained by connecting 100 kΩ load resistor in series with the detector. Determine the output voltage across th load.

- (a) 15 V
- (b) 5 V
- (c) 20 V
- (d) 10 V

Accepted Answers:
(d) 10 V

4) *2 points*

Find the current developed in a photodiode with a quantum efficiency of 75 %. The phot diode is illuminated with a light of wavelength 1300 nm and radiant power 70 microWatt (Plank's constant h = 6.62×10^{-34} Joule-second, charge on electron e = 1.602×10^{-19} C, velocit of light c = 3×10^{8} m/s)

- (a) 82.5 microA
- (b) 55 microA
- (c) 27.5 microA
- (d) 110 microA

Accepted Answers:
(b) 55 microA

5) An optical fibre is characterized by- **2 points**

- (a) Refractive Index (RI) of the core material is less than that of the cladding.
- (b) Total Internal Reflection.
- (c) Refractive Index (RI) of the core material is greater than that of the cladding.
- (d) Both (b) and (c).

Accepted Answers:
(d) Both (b) and (c).

6) **2 points**

For the fibre optic based displacement sensor as shown in Fig. 1, the output light intensit does not depend on-

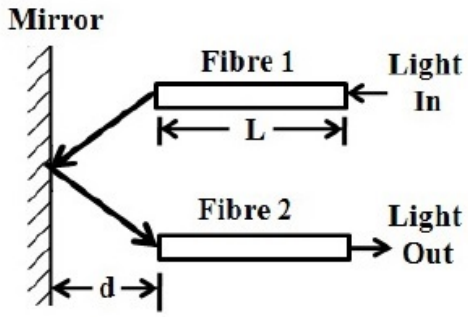

Fig. 1 Fibre Optic based displacement sensor

- (a) Numerical aperture of both the fibres.
- (b) Length L of the fibres.
- (c) Distance d.
- (d) Reflectivity of the mirror.

Accepted Answers:
(b) Length L of the fibres.

7) **2 points**

The refractive indices of glass and water are 1.5 and 1.35 respectively. If the glass immersed in water, its relative refractive index will be-

- (a) 1.111
- (b) 2.222
- (c) 1.8
- (d) 1.5

Accepted Answers:
(a) 1.111

8) **2 points**

Relative permittivity (ε_r) of an optical medium is 2.8. The refractive Index of the medium is-

- (a) 0.7
- (b) 1.4
- (c) 1.67
- (d) Can not be determined from the given data.

Accepted Answers:
(c) 1.67

9) **2 points**

The numerical aperture of a step index fibre in air (i.e., R.I. = 1) is 0.39. The fibre i immersed in liquid of R.I. 1.255. The angle of acceptance (AA) is closest to-

- (a) 15 deg
- (b) 9.05 deg
- (c) 36.2 deg
- (d) 18.10 deg

Accepted Answers:
(d) 18.10 deg

10) **2 points**

What is the loss in an optical fibre, when an optical signal after traversing a distance o 500 m in the fibre, has lost 70 % of its input power?

- (a) 10.45 dB/km
- (b) 20.90 dB/km
- (c) 5.23 dB/km
- (d) None of these.

Accepted Answers:
(a) 10.45 dB/km

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