

Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

 Optical sensors system

 Optical sources

 Optical receivers - 1

 Optical receivers - 2

 Optical Fiber Sensors : Week 2 Feedback Form

 Quiz : Assignment 2

 Assignment 2 solutions

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

[Download Videos](#)
[Live Session](#)
[Text Transcripts](#)

Assignment 2

The due date for submitting this assignment has passed.

Due on 2021-02-07, 23:59 IST.

As per our records you have not submitted this assignment.

1) For a LED source operated at a drive current of 20 mA, the rate at which the carriers are injected is _____(/sec) ((provide answer in scientific notation with one decimal accuracy, e.g. 6.2e14) .

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 12e16,13e16

1 point

2) State whether the following statements are true or false

- (i) Active region of LED has a lower band gap energy than the surrounding region in double heterostructure
(ii) Light emission happens only in the active region for an LED.

- (i)True,(ii)False
 (i)True,(ii)True
 (i)False,(ii)False
 (i)False,(ii)True

No, the answer is incorrect.
Score: 0

Accepted Answers:
(i)True,(ii)False

1 point

3) Which one of the following helps in improving internal conversion efficiency of LEDs ?

- Long radiative lifetime and long non-radiative lifetime
 Long radiative lifetime and short non-radiative lifetime
 Short radiative lifetime and long non-radiative life time
 Short radiative lifetime and short non-radiative lifetime

No, the answer is incorrect.
Score: 0

Accepted Answers:
Short radiative lifetime and long non-radiative life time

1 point

4) What happens to the LED output if dimension of the active region is comparable to the wavelength of emitted light?

- Output power increases
 Carrier lifetime increases
 Spatial coherence increases
 All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Spatial coherence increases

1 point

5) A LED is designed with GaAlAs and it is found that the radiative recombination lifetime of carriers is 2.5 ns and non-radiative recombination lifetime is thrice that of radiative recombination lifetime. The internal quantum efficiency of the LED is _____

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.7,0.8

1 point

6) How can we improve the external light extraction efficiency in LEDs ?

- Frustrating total internal reflection at interface
 Introduce corrugation at the interface
 Antireflection at the interface
 All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

1 point

7) The external extraction efficiency of an LED for light escaping into air from GaN whose refractive index is 2.5 is _____ (provide answer with three decimal accuracy)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.03,0.04

0 points

8) For a given internal efficiency, the responsivity of a photodiode scales as _____

- λ
 λ^2
 $\lambda^{0.5}$
 $1/\lambda$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 λ

1 point

9) A semiconductor laser diode operating at 1550 nm wavelength is made with GaAs crystal (refractive index, $n = 3.6$) of cavity length $L = 500\mu\text{m}$. A fraction of output is taken from one of the facets (mirrors) and the loss associated with that facet is 10 /cm and the total cavity loss is given as 30 /cm, resulting in a laser threshold current of 25 mA. If the engineer is interested in 50 mW power at the output, the value of drive current is _____. (assume internal efficiency $\eta_{int} = 1$, $h = 6.626 \times 10^{-34} \text{Joul. sec}$)

- 212.4 mA
 150.8 mA
 120 mA
 34.5 mA

No, the answer is incorrect.
Score: 0

Accepted Answers:
212.4 mA

1 point

10) For a LED operating at 1330 nm wavelength whose internal quantum efficiency is 0.75 and extraction efficiency is 0.2, the output optical power when driven by a current of 30 mA is ____ mW. (provide answer with two decimal accuracy)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 4,4.5

0 points

11) For a p-i-n photo diode the intrinsic region width is given as $1\mu\text{m}$ and the drift velocity due to the built in electric field in the i-region is 10^5 m/sec , then the transit time of the carriers is ____ (sec) (provide answer in scientific notation with one decimal accuracy)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 9.5e-12,10.5e-12

1 point

12) Which of the following materials for an APD is likely to provide the maximum value of optimum gain ? (Hint: k is impact ionization ratio)

- k=0.1
 k=2
 k=20
 k=1

No, the answer is incorrect.
Score: 0

Accepted Answers:
k=20

1 point