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reviewer4@nptel.iitm.ac.in ▼

Courses » Semiconductors Optoelectronics

Announcements **Course** Ask a Question Progress FAQ

Unit 11 - Week 9

Register for
Certification exam

Course outline

How to access
the portalSelf-assessment
before course
start

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

- Laser Basics
- Semiconductor
Laser - I:
Device
Structure
- Semiconductor
Laser - II:
Output
Characteristics

Assessment 9

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2019-04-03, 23:59 IST.**

Instructions:

1. Answer **all** questions; all questions carry equal mark.
2. All symbols have their usual meanings.
3. Only one of the options is correct
4. The 4th question is a "fill in the blank" type of question. You are supposed to enter a numerical answer to fill the blank as given in the question. Your answer must be correct upto two decimal places (unless it is an integer).
5. You can see the correct answers after the last date of submission.

Note:

Marks obtained in this quiz will be counted towards your final score. You can take the quiz and submit it any number of times, and the latest submitted answers will be taken as your final submission.

Physical Constants:

 $m_0 = 9.11 \times 10^{-31} \text{ kg}$; $h = 6.627 \times 10^{-34} \text{ J}\cdot\text{s}$; $e = 1.602 \times 10^{-19} \text{ C}$; $k_B = 1.38 \times 10^{-23} \text{ J/K}$

1) What is the maximum possible number of longitudinal modes in the output of a Fabry-Perot **1 point** semiconductor laser? Given: cavity length = 250 μm , active medium refractive index = 3.4, laser bandwidth = 1 THz.

- 5
- 6
- 11
- 12

No, the answer is incorrect.

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Week 11

Week 12

Exam
InstructionsLecture
Transcripts

- Decreasing the thickness of the active layer
- Increasing the cladding refractive index.
- Increasing the width of the active layer.
- Decreasing the length of the active layer.

No, the answer is incorrect.**Score: 0****Accepted Answers:***Increasing the width of the active layer.*

3) Which one of the following statements regarding a double-heterostructure laser is correct?

1 point

- The refractive index of the active layer is lower than the refractive index of the cladding layers.
- A high carrier density ($\Delta n > \Delta n_T$) can be achieved in the active layer only at very high injection currents.
- The transverse mode size of the laser output will change if the alloy composition of the active layer is changed.
- The transverse mode field is zero outside the active layer.

No, the answer is incorrect.**Score: 0****Accepted Answers:***The transverse mode size of the laser output will change if the alloy composition of the active layer is changed.*

4) It is given that for a semiconductor laser of length 500 μm , the threshold gain coefficient is 36 cm^{-1} . If the cleaved end facets have reflectivities of 40% each, and there is no other loss in the cavity, then the optical confinement factor of the lasing mode is _____.

No, the answer is incorrect.**Score: 0****Accepted Answers:***(Type: Range) 0.50,0.52***1 point**

5) For a particular semiconductor gain medium, the following observations were made:

1 point

- When the injection current through the gain medium is zero, the intensity of light at the output is reduced to half its input intensity.
- For an injection current of 150 mA, the intensity of light at the output is 4 times as that of the input.

By what injection current should the gain medium be pumped so that intensity of light at the output is 8 times as that of the input? (Assume that the 'peak gain' is at the input wavelength for all currents)

Note: You may use the formula

$$\gamma_p = \alpha_a \left(\frac{i}{i_T} - 1 \right)$$

where the symbols have their usual meaning.

- 100 mA
- 150 mA
- 200 mA
- 250 mA

No, the answer is incorrect.

Score: 0

Accepted Answers:

200 mA

[Previous Page](#)

[End](#)