

Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

- Transverse Modes of a Spherical Mirror Resonator
- Gaussian Mode of the Spherical Mirror Resonator
- Longitudinal Modes of a Spherical Mirror Resonator
- Week 7 Feedback Form
- Quiz : Assignment 7

Week 8

Week 9

Week 10

Week 11

Week 12

Assignment Solutions

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Assignment 7

The due date for submitting this assignment has passed.

Due on 2021-03-10, 23:59 IST.

As per our records you have not submitted this assignment.

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. Take care of the units in numerical problems, to match with the units given in the options (of MCQs), and the units in which answers have to be entered (in fill in the blank type of questions).
5. In the fill in the blank type of questions, only the numerical values have to be entered.

NOTE: You can see the correct answers after the last date of submission. 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.

- 1) Which one of the following *must* remain the same after one roundtrip of a *transverse mode* of an optical resonator? **1 point**
- Phase of the mode
 - Amplitude of the mode
 - Energy of the mode
 - Field distribution of the mode

No, the answer is incorrect.
Score: 0
Accepted Answers:
Field distribution of the mode

- 2) $U_{l,m}$ represents the *Hermite-Gauss modes* of an optical resonator, where l and m are integers.

$$U_{l,m}(x, y, z) = A_{l,m} \left[\frac{W_0}{W(z)} \right] e^{-\frac{(x^2+y^2)}{w^2(z)}} H_l \left[\frac{\sqrt{2}x}{W(z)} \right] H_m \left[\frac{\sqrt{2}y}{W(z)} \right] \times e^{-i \left[kz + \frac{k(x^2+y^2)}{2R(z)} - (l+m+1)\zeta(z) \right]}$$

If the field distribution of a particular mode is *Gaussian*, then the numerical value of $l+m+1$ is

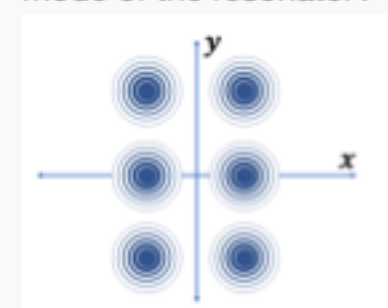
No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 1

- 3) In the above question (Q. No. 2), if the waist size is 1 mm, then the spot size at Rayleigh range is ____ mm. **1 point**

(Write your answer up to 3 decimal places)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.364,1.464

- 4) The intensity pattern (in a transverse plane of a spherical mirror resonator) of the Hermite- Gauss mode shown below corresponds to which mode of the resonator? **1 point**



- TEM₃₂
- TEM₂₃
- TEM₁₂
- TEM₂₁

No, the answer is incorrect.
Score: 0
Accepted Answers:
TEM₁₂

- 5) The *degeneracy* at the resonance frequency corresponding to the transverse mode in Q. 4 above is ____ .

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 4

- 6) If a *diverging* Gaussian beam of RoC 15 cm becomes a *converging* Gaussian beam of RoC 10 cm immediately after reflection from a mirror, then the RoC of the mirror is ____cm. **1 point**

Note: Enter + or - sign along with the numerical value.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -13,-11

- 7) If a stable optical resonator has the waist of the Gaussian mode exactly at the position of one of the mirrors, then, the resonator is a **1 point**

- Symmetric plane mirror resonator
- Symmetric spherical mirror resonator
- Plane-concave mirror resonator
- Plane-convex mirror resonator

No, the answer is incorrect.
Score: 0
Accepted Answers:
Plane-concave mirror resonator

- 8) A particular experiment requires that the output from a stable optical resonator is a converging Gaussian beam. Which one of the following resonators can fulfill the requirement? **1 point**

- Plane-convex mirror resonator
- Concave-convex mirror resonator
- Plane-concave mirror resonator
- Symmetric concave mirror resonator

No, the answer is incorrect.
Score: 0
Accepted Answers:
Concave-convex mirror resonator

- 9) In the above question (Q.8), if the RoC of the output mirror (M_2) is 15 cm, the RoC of mirror M_1 is 20 cm, and the separation between the two mirrors is 10 cm, then the position of mirror M_2 is __ cm.

(Please use appropriate signs for the RoCs and the position of the mirrors. Also, enter the answer up to two decimal places.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -7.17,-6.17

- 10) In the above question (Q.9), the *waist* size of the Gaussian beam at the operating wavelength of 1 μm would be ____ μm . **1 point**

Please enter the answer as integer; leave the decimals.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 149,159

1 point