Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6
- ● Spherical Mirror Resonators
- ● Resonator Stability Condition
- ● Ray Paths in Spherical Mirror Resonators
- ● Week 6 Feedback Form
- ○ Quiz : Assignment 6

Week 7

Week 8

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Week 12

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Assignment 6

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment.

Due on 2021-03-03, 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. 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) State whether the following statement is TRUE or FALSE   **1 point**

The resonance peaks are sharper in the case of spherical mirror resonators as compared to plane mirror resonators because the diffraction loss is much less in the former as compared to that in the latter (assuming that the reflectivities of the mirrors, and the length of the resonators are the same in the two cases).

- ○ TRUE
- ○ FALSE

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

2) Which one of the following pairs of mirrors cannot form a stable resonator?   **1 point**

- ○ 2 plane mirrors
- ○ Plane mirror and concave mirror
- ○ Plane mirror and convex mirror
- ○ Concave mirror and convex mirror

No, the answer is incorrect.
Score: 0
Accepted Answers:
Plane mirror and convex mirror

3) Which one of the following ray transfer matrices represents refraction at the interface between air and water when a ray travels from air to water? Given: Refractive index of water = 4/3   **1 point**

- ○ $\begin{bmatrix} 1 & 0 \\ 0 & \frac{4}{3} \end{bmatrix}$
- ○ $\begin{bmatrix} 1 & 0 \\ 0 & \frac{3}{4} \end{bmatrix}$
- ○ $\begin{bmatrix} 1 & \frac{4}{3} \\ 0 & 1 \end{bmatrix}$
- ○ $\begin{bmatrix} 1 & \frac{3}{4} \\ 0 & 1 \end{bmatrix}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\begin{bmatrix} 1 & 0 \\ 0 & \frac{3}{4} \end{bmatrix}$

4) The ray transfer matrix (after one round trip) for a particular open resonator formed by two mirrors is given by: **1 point**

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} 1 & p \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ q & 1 \end{bmatrix}\begin{bmatrix} 1 & p \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

where $p > 0, q < 0$. The resonator is a

- ○ Plane mirror resonator
- ○ Confocal mirror resonator
- ○ Plano-convex mirror resonator
- ○ Plano-concave mirror resonator

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

5) In the above question (Q. 4), if the resonator is stable, then $p \leq x$, where $x =$ **1 point**

- ○ $-q$
- ○ $-1/q$
- ○ $-2q$
- ○ $-2/q$

No, the answer is incorrect.
Score: 0
Accepted Answers:
-2/q

6) The ray coordinates after one round trip in a spherical mirror resonator is given by: **1 point**

$$\begin{bmatrix} y_1 \\ \theta_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix}\begin{bmatrix} y_0 \\ \theta_0 \end{bmatrix}$$

Which one of the following conditions is always true?

- ○ $-2 \leq (A+D) \leq 2$
- ○ $-1 \leq (A+D) \leq 1$
- ○ $AD - BC = 1$
- ○ $AD - BC = 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
AD - BC=1

7) In the above question Q.6, if A = −3. Then, the resonator is a   **1 point**

- ○ Confocal mirror resonator with mirrors of focal length -1/C.
- ○ Confocal mirror resonator with mirrors of focal length -2/C.
- ○ Concentric mirror resonator with mirrors of focal length -1/C.
- ○ Concentric mirror resonator with mirrors of focal length -2/C.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Concentric mirror resonator with mirrors of focal length -2/C.

8) A symmetric mirror resonator of length L = 10 cm and R = −10 cm is a stable resonator. The ray will retrace its path after ___ round trips.

(Enter the answer as an integer).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 2

            1 point

9) State whether the following statement is TRUE or FALSE: **1 point**

A symmetric spherical mirror resonator can be stable even if the separation between the mirrors is much greater than the focal length of the mirrors (forming the resonator).

- ○ TRUE
- ○ FALSE

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

10) A spherical mirror resonator is such that the ROCs of the mirrors are R_1 = 20 cm and R_2 = −10 cm. The maximum separation between the mirrors for which the resonator would be stable is ___cm.

(Enter the answer upto one decimal)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 9.5,10.5

            1 point