EEE 333 - Optical Communication Devices

Optical Aperture MCQ Questions

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MCQ Questions

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1. Q What is a beam aperture?

(a) A device that controls the intensity of a light beam

(b) Any opening in the source through which the beam radiation is emitted

(c) The region where light waves interfere and create a diffraction pattern

(d) A lens used to focus a light beam

1. A (b)

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2. Q What is beam diffraction?

(a) The spreading out of a light beam as it travels through small apertures

(b) The reflection of light waves off a surface

(c) The bending of light waves as they pass through a medium with varying refractive index

(d) The absorption of light by a material

2. A (a)

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3. Q According to Huygens' principle, how can diffraction be predicted?

(a) By analyzing the interference pattern of diffracted light waves

(b) By using lenses to focus the diffracted light

(c) By replacing the wavefront with a series of equally spaced secondary point sources emitting in phase

(d) By measuring the wavelength of the diffracted light

3. A (c)

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4. Q What happens to a beam of light when it is passed through an aperture?

(a) It is absorbed by the aperture material

(b) It is refracted and changes its direction

(c) It is diffracted and diverges at an angle

(d) It remains unchanged in direction and intensity

4. A (c)

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5. Q What is the beam diameter at a point in space?

(a) The width u of the aperture through which the beam is passed

(b) The diameter of the smallest circle that contains $u\%$ the laser power

(c) The distance u between the source of the beam and the point in space

(d) The wavelength $_u$ of the light in the beam

5. A (b)

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6. Q What does the term d_{63} refer to in the context of a Gaussian beam?

(a) The point where the irradiance increases to $1/e$ of its central peak value

(b) The point where the irradiance increases to $1/\pi$ of its central peak value

(c) The point where the irradiance falls to $1/e$ of its central peak value

(d) The point where the irradiance falls to $1/\pi$ of its central peak value

6. A (c)

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7. Q What does the beam diameter define?

(a) The intensity of the laser beam

(b) The divergence angle of the beam

(c) The wavelength of the laser beam

(d) The distance between the source and the aperture

7. A (b)

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8. Q What happens to the divergence angle when a radiation beam is collimated (parallel)?

(a) It remains constant regardless of beam diameter

(b) It becomes infinite

(c) It tends to zero and becomes very small

(d) It becomes larger and more spread out

8. A (c)

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9. Q What is the formula to calculate divergence using beam diameter?

(a) $\theta = d_{63} - d'_{63}$

(b) $\theta = \dfrac{d_{63} + d'_{63}}{2}$

(c) $\theta = \dfrac{d_{63} - d'_{63}}{r}$

(d) $\theta = 2\tan^{-1}\left(\dfrac{d_{63} - d'_{63}}{2r}\right)$

9. A (d)

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10. Q What is the purpose of attaching a lens to the front end of the receiver system?

(a) To block unwanted light from entering the system

(b) To decrease the size of the detector

(c) To focus the received light onto the detector

(d) To increase the noise of the detector

10. A (c)

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11. Q What type of material is typically used to make lenses?

(a) Optically refractive reflective materials

(b) Optically dim reflective materials

(c) Optically absorbent reflective materials

(d) Optically transparent refractive materials

11. A (d)

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12. Q What is the role of an aperture lens as an imaging optical element?

(a) To block unwanted signals from reaching the detector

(b) To focus the received light to a single point on the detector surface

(c) To map signals arriving at different angles to separate locations on the detector

(d) All of the above

12. A (c)

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13. Q What is the function of an aperture lens in the receiver system?

(a) To act as a barrier against incoming light

(b) To decrease the collecting area of the detector

(c) To reduce the signal received by the detector

(d) To enlarge the effective collecting area of the detector without the penalty of increasing the detector noise.

13. A (d)

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14. Q What is the function of the focal-plane detector?

(a) To converge the light rays onto the focal plane

(b) To focus the light rays onto the lens

(c) To enlarge the diameter of the lens

(d) To control the F-number of the lens

14. A (a)

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15. Q How are the focal length and the diameter of the lens related?

(a) The efficiency of the lens in focusing light

(b) The ratio of the focal length to the diameter of the lens

(c) The amount of light reflected by the focal plane

(d) The distance between the focal plane and the lens

15. A (b)

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16. Q The F-number $F_{\#}$ can be described as .....

(a) $F_{\#} = \dfrac{f_l}{d_l}$

(b) $F_{\#} = \dfrac{d_l}{f_l}$

(c) $F_{\#} = f_l \times d_l$

(d) $F_{\#} = \dfrac{f_l + d_l}{2}$

16. A (a)

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17. Q What does the angle of view determine for a detector?

(a) The field-of-view (FOV) of the detector

(b) The intensity of the optical radiation

(c) The direction of the optical radiation

(d) The wavelength of the optical radiation

17. A (a)

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18. Q What is the significance of a smaller F-number lens in relation to the angle of view?

(a) A smaller F-number lens leads to a larger angle of view

(b) A smaller F-number lens leads to a smaller angle of view

(c) The F-number of the lens does not affect the angle of view

(d) The F-number of the lens determines the direction of the optical

18. A (a)

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19. Q What does the angle of view represent for a detector?

(a) The maximum distance at which the detector can detect optical radiation

(b) The equivalent F-number

(c) The range of wavelengths detected by the detector

(d) The angular range within which the detector responds to optical radiation

19. A (d)

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20. Q How is the angle of view determined?

(a) by the ratio of the diameter of the focal lens to the focal plane detector

(b) by the multiplication of the diameter of the focal plane detector and the focal lens

(c) by the summation of the diameter of the focal plane detector and the focal lens

(d) by the ratio of the diameter of the focal plane detector to the focal lens

20. A (d)

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21. Q Angle of View (Acceptance) is described by the .....

(a) receiver cone half-apex angle

(b) receiver cone half-apex angle

(c) diameter of the focal plane detector

(d) beam diameter

21. A (a)