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BRAINWARE UNIVERSITY

Term End Examination 2023
Programme – B.Optomtry-2022
Course Name – Geometrical Optics
Course Code - BOPTOC205
(Semester II)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) A water tank appears shallower when it is viewed from top due to
- | | |
|-------------------------------------|---------------|
| a) rectilinear propagation of light | b) reflection |
| c) total internal reflection | d) refraction |
- (ii) Two thin lenses are put close to each other. The focal length of the combination is :
- | | |
|--|---|
| a) less than the small focal length | b) more than the bigger focal length |
| c) equal to the arithmetical average of the focal length | d) equal to the geometrical average of the focal length |
- (iii) Which colour of light shows maximum deviation when passed through a prism?
- | | |
|-----------|-----------|
| a) red | b) green |
| c) violet | d) yellow |
- (iv) A rear-view mirror for driving is
- | | |
|-----------|-------------|
| a) plain | b) concave |
| c) convex | d) inverted |
- (v) Power of the lens is -40 D, calculate its focal length.
- | | |
|------------|---------|
| a) 4m | b) -40m |
| c) -0.025m | d) -25m |
- (vi) Where an object should be placed in front of a convex lens to get a real image of the size of the object?
- | | |
|---------------------------------------|---|
| a) at the principal focus of the lens | b) at twice the focal length |
| c) at infinity | d) between the optical centre of the lens and its principal focus |
- (vii) Image formed by plane mirror is

- a) Real and erect
c) Virtual and erect
- b) Real and inverted
d) Virtual and inverted
- (viii) A point object is placed at a distance of 30 cm from a convex mirror of focal length 30 cm. Determine the image position.
- a) infinity
c) focus
- b) pole
d) 15 cm behind the mirror.
- (ix) The focal length of a plane mirror is
- a) 0
c) 25 cm
- b) infinite
d) -25 cm
- (x) When light passes from air to glass, then
- a) Wavelength increases
c) Frequency decreases
- b) Wavelength decreases
d) Velocity remains constant
- (xi) For which of the following cases will the total internal reflection of light be possible?
- a) angle of incidence is less than the critical angle.
c) angle of incidence is greater than the critical angle.
- b) angle of incidence is equal to the critical angle.
d) angle of incidence is equal to the angle of refraction.
- (xii) Magnification for convex mirror is
- a) always positive
c) sometimes positive
- b) always negative
d) 1
- (xiii) What kind of image is created by a concave lens?
- a) upright and smaller
c) inverted and larger
- b) inverted and smaller
d) upright and smaller
- (xiv) If the angle of incidence, $\theta_i = 0^\circ$, the angle of reflection, $\theta_r =$
- a) 0°
c) 180°
- b) 90°
d) 45°
- (xv) If an object is placed away from $2f$ of a converging lens then what will be the nature of the image?
- a) real and erect
c) inverted
- b) virtual and erect
d) virtual

Group-B

(Short Answer Type Questions)

3 x 5=15

2. The magnification produced by a plane mirror is +1. What does this mean? (3)
3. A convex lens of focal length 24 cm ($\mu=1.5$) is totally immersed in water ($\mu=1.33$). Calculate its focal length in water. (3)
4. Why will total internal reflection not take place if light travels from rarer to a denser medium? (3)
5. A biconvex lens has radii of curvature 20 cm each. If the refractive index of the material of the lens is 1.5. Calculate its focal length. (3)

6. A ball is placed 3.0 cm in front of a lens. If the image of the ball appears to be 21.0 cm behind the lens, Calculate the magnification of the lens. (3)

OR

Calculate the power of two thin lenses of focal length f_1 and f_2 separated by a distance d . (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. State laws of reflection of light. Define absolute refractive index of a medium. (5)
8. Derive the spherical mirror equation for a concave mirror. (5)
9. Show that for refraction at a concave spherical surface (separating glass-air medium), the distance of the object should be greater than three times the radius of curvature of the refracting surface for the image to be real. (5)
10. Two identical thin convex lenses of focal lengths 8 cm each are coaxial and 4 cm apart. Calculate the equivalent focal length and positions of the principal points. (5)
11. Calculate the lateral and the longitudinal magnification for refraction at a spherical surface. (5)
12. The distance of an object from a convex lens is 20 cm. If the focal length of the lens is 15 cm, Estimate the position and nature of the image. (5)

OR

A convex refracting surface of radius of curvature 40 cm separates two media of refractive indices $4/3$ and 1.50. An object is kept in the first medium at a distance of 20 cm from the surface. Estimate the position of the image. (5)
