BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(RA)-2021
Course Name – Fiber Optic and Photonics
Course Code - PEC-ECR701C
(Semester VII)

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) The core of an optical fiber shows
a) Higher refractive index than the cladding
b) Similar refractive index with the cladding
c) Lower refractive index than air
d) Lower refractive index than the cladding

(ii) If a mirror is employed to reflect light, the reflected light angle is ____ as the incident angle
a) Smaller
b) Larger
c) The same
d) Independent

(iii) Which theory states that the light wave behaves as if it consists of many tiny particles?
a) Huygen's theory
b) Wave theory of light
c) Nyquist theory
d) Quantum theory

(iv) Longitudinal waves do not show
a) Polarization
b) Refraction
c) Reflection
d) Diffraction

(v) _____ is produced by the difference in the propagation times of light rays that take different paths in a fiber.
a) Material dispersion
b) Wavelength dispersion
c) Modal dispersion
d) Delay dispersion

(vi) Which among the following is described by the concept of numerical aperture in an optical fiber?
a) Light collection
b) Light scattering
c) Light dispersion
d) Light polarization

(vii) In spontaneous emission, the light source changes from an excited state to one with _____
a) Higher energy b) Moderate energy
c) Lower energy d) All of these

(viii) Which method determines the dispersion limitation of an optical link?
a) Link power budget b) Rise time budget
c) Both (a) and (b) d) None of these

(ix) Which phenomenon produces the dynamic line width broadening under the direct modulation of injection current?
a) Modal noise b) Mode-partition noise
c) Frequency chirping d) Reflection Noise

(x) In the structure of fiber, the light is guided through the core due to total internal _____
a) reflection b) refraction
c) diffraction d) dispersion

(xi) Which rays exhibit the variation in the light acceptability ability of the fiber?
a) Skew b) Meridional
c) Leaky d) All of these

(xii) When the incidence angle is _____ the specified critical angle, the light rays bend along the intersection line of two different mediums of propagation.
a) more than b) less than
c) equal to d) not related with

(xiii) Usually, various types of transmission media are classified as:
a) metallic or nonmetallic b) guided or unguided
c) determinate or indeterminate d) fixed or unfixed

(xiv) In optical fiber, identify the outer layer and inner layer
a) core, cladding b) cladding, core
c) reflect, transmit d) transmit, reflect

(xv) Fiber optic system has three basic components, in the order namely
a) light guide, light source, light detector b) light source, light guide, light detector
c) light detector, light source, light guide d) light guide, light detector, light source

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain step index and graded index fiber mentioning their refractive index profile. (3)

3. Compare between mono mode fiber and multimode fiber. (3)

4. List the applications of optical fiber communication system. (3)

5. Write a short note on LASER. (3)

6. Explain how data transmission occurs in optical networks. (3)

OR

Explain the role of optical switches in optical networks. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Identify different losses associated with optical fiber. (5)

8. Define (i) Refractive index. (ii) V number (iii) Critical angle. (5)

9. Compare satellite communication and fiber optic communication. (5)

10. Compare the merits and demerits of fiber optic communication system. (5)

11. Write a brief note on Fiber Bragg Grating. (5)

12. Summarize different nonlinear optical effects due to Kerr nonlinearity. (5)

OR

A step index fiber has a core with refractive index of 1.55 and a cladding with a refractive index of 1.51. Evaluate the acceptance angle and numerical aperture of the fiber. (5)

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