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Name.....

Reg. No.....

THIRD SEMESTER B.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION
NOVEMBER 2016

(UG—CCSS)

Complementary Course

PH 3C 05—OPTICS, LASER, ELECTRONICS AND COMMUNICATION

(2013 Admissions)

Time : Three Hours

Maximum : 30 Weightage

I. Answer all *twelve* questions :

1. Which of the following physical quantity does not appear in Fermats principle.
(a) Time. (b) Optial path length.
(c) Area. (d) None of the above.
2. Device which can't produce two coherent sources is :
(a) Fresnel's biprism. (b) Young's double slit.
(c) Polari meter. (d) Lloyd's mirror.
3. Two coherent sources whose intensity ratio is 81 : 1 produce interference fringes. The ratio of maximum intensity to minimum intensity in fringe system is :
(a) 25/16. (b) 16/25.
(c) 6/5. (d) 5/6.
4. Two slits are made 1 mm apart and the scree is placed 1m away. What is fringe separation when light of wavelength 500 nm is used.
(a) 1 mm. (b) 0.5 mm.
(c) 0.25 mm. (d) None of the above.
5. The bending of beam of light around corners of obstacles is called :
(a) Reflection. (b) Diffraction.
(c) Refraction. (d) Interference.
6. The first diffraction minima due to a single slit diffraction is at $\theta = 30^\circ$ for a light of $\lambda = 500 \text{ \AA}$. The width of the slit is :
(a) $5 \times 10^{-5} \text{ cm}$. (b) $1 \times 10^{-5} \text{ cm}$.
(c) 2.5 nm. (d) 3 μm .

Turn over

7. Select the wrong statement. (a) When light travels in vacuum, the electric and magnetic vectors are :

- (a) Constant in time.
- (b) Have zero average values.
- (c) Mutually perpendicular.
- (d) Perpendicular in the direction of propagation of waves.

8. When a Polaroid placed in the path of light is rotated, the intensity of light appears to but never reduces to zero. The light is :

- (a) Unpolarised.
- (b) Plane-polarized.
- (c) Partially plane - polarized.
- (d) No conclusion can be drawn.

9. A Zener diode is basically used :

- (a) A constant voltage source.
- (b) A constant current source.
- (c) A rectifier.
- (d) None of the above.

10. The most commonly used material for making transistor is :

- (a) Copper.
- (b) Silicon.
- (c) Ebonite.
- (d) Silver.

11. The process of superimposing signal frequency on the carrier wave is known as :

- (a) Modulation.
- (b) Reception.
- (c) Detection.
- (d) Transmission.

12. The carrier frequency generated by a tank circuit containing 1 nF capacitor and 10 μ H inductor is :

- (a) 1592 Hz.
- (b) 1593 Hz.
- (c) 1592 kHz.
- (d) 159.2 Hz.

(12 \times $\frac{3}{4}$ = 3 weightage)

II. Answer all *nine* questions, each question carries 1 weightage :

- 13 Illustrate Fermat's principle using direct propagation.
- 14 Obtain the relation between path difference and phase difference.
- 15 Obtain the condition for destructive interference.
- 16 Write down the expression for bandwidth.
- 17 What is double refraction ?

18. What is the principle of an oscillator ?
19. Give the importance of population inversion in Laser.
20. What is step index fibre ?
21. What is Amplitude modulation ?

(9 × 1 = 9 weightage)

III. Answer any *five* questions, each question carries 2 weightage :

22. White light falls normally on a thin film of thickness 400 nm and refractive index 1.5. What wavelength in the visible spectrum will be reflected most strongly ?
23. Determine the angular separation between central maximum and first-order maximum of the diffraction pattern due to a single slit of width 0.25 mm when light of wavelength 589 nm is incident normally on it.
24. Discuss the construction of Zone plate.
25. Explain the various methods of detection of polarized light.
26. Show that the maximum possible efficiency of a full wave rectifier is 81.2%.
27. Explain why CE configuration is most popular in amplifier circuits ?
28. Discuss the merits and demerits of FM over AM.

(5 × 2 = 10 weightage)

IV. Answer any *two* questions, each question carries 4 weightage :

29. Give the theory of the Newton's rings. Explain how rings can be used to find the refractive index of liquid ?
30. Explain the main difference between an amplifier and an oscillator. Draw the circuit diagram of Colpitts oscillator. Explain briefly how it operates.
31. Give the important components of a fibre optic system with specific use of each component. Give the reasons of attenuation and distortion of light through the optical fibre.

(2 × 4 = 8 weightage)