19U317S (Pages: 2) Name: ….……

Reg. No……

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2020

(CUCBCSS - UG)

CC15U PH3 C03 - OPTICS, LASER, ELECTRONICS & COMMUNICATION

(Physics - Complementary Course)

(2015 to 2018 Admissions – Supplementary/Improvement)

Time: Three Hours Maximum: 64 Marks

Section A

Answer ***all*** questions. Each question carries 1 mark.

1. For proper functioning of a transistor, emitter base junction is

   a) Always forward biased b) Always reverse biased

   c) Either forward or reverse biased d) None of these

2. In Ruby laser, the active medium is

   a) Al_2O_3 b) O_3 c) Cr^{3+} d) Cr_2O_3

3. A soap bubble appear multi coloured in white light due to

   a) Interference b) Diffraction c) Polarization d) Scattering

4. Fraunhoffer diffraction can be observed with

   a) Two narrow slits b) One narrow slit

   c) Large number of narrow slits d) All are correct

5. A Nicol prism is based on the principle of

   a) Refraction b) Scattering c) Dichroism d) Double refraction

6. The frequency of LC oscillator is

   a) Directly proportional to LC b) Directly proportional to 1/LC

   c) Directly proportional to √LC d) Directly proportional to 1/√LC

7. In a transistor β=100 and collector current is 10mA, then Emitter current is

   a) 100mA b) 100.1mA c) 110mA d) None of these

8. Along the optical axis velocities of e-ray and o-ray are

   a) Same b) Opposite c) Double d) None

9. Ruby laser is a …… Pumping system

   a) Two level b) Three level c) Four level d) None

10. Quartz crystal is

    a) Dextro rotatory b) Laevo rotatory c) Can be both d) None of these

(10 × 1 = 10 Marks)

Section B

Answer ***all*** questions. Each question carries 2 marks.

11. Explain the action of a π filter.
12. Obtain an expression for resolving power of a grating.
13. State and explain Fermats principle.
14. Obtain a relation between α and β and also between α and γ.
15. Briefly discuss amplitude modulation.
16. Describe working of semiconductor laser.
17. What is a wave plate? Describe quarter wave plate and half wave plate.

(7 × 2 = 14 Marks)

Section C

Answer any ***two*** questions. Each question carries 4 marks

18. Explain optical activity. What is levorotation?
19. Explain the Frequency response and bandwidth of an amplifier.
20. Explain theory of Plane diffraction Grating.
21. What is meant by population inversion and pumping?
22. State and derive Brewster's law.

(2 × 4 = 8 Marks)

Section D

Answer any ***three*** questions. Each question carries 4 marks

23. What is the highest order spectrum which may be seen with monochromatic light of wavelength 6000Å, by means of a grating having 5000 lines cm^{-1}.
24. Show that $(A+B)(\bar{A}+\bar{B})=A\bar{B}+\bar{B}A$
25. In a bi prism experiment at a certain position of the eyepiece, the fringe width obtained is 0.2 mm. When the eyepiece is moved away by 50 cm, the fringe width becomes 3 mm. If the distance between the two sources is 0.3 cm, find the wavelength of light used.
26. If the critical angle for glass boundary is 38^0, calculate the polarizing angle for glass.
27. A 20 cm long tube containing $50cm^3$ of sugar solution produces an optical rotation of 10^0. Calculate the quantity of sugar contained in the solution. Specific rotation of sugar is 65^0.

(3 × 4 = 12 Marks)

Section E

Answer any ***two*** questions. Each question carries 10 marks.

28. What is Rayleigh's criterion for resolution? Explain the method to determine the wavelengths using grating.
29. Explain feedback amplifier in detail and derive an expression for the gain.
30. Explain the theory of the production of circularly, elliptically and plane polarized light waves.
31. Explain the principle, construction and working of a four stage laser.

(2 × 10 = 20 Marks)

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