1B2A23095 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Second Semester B.Sc Degree Examination, April 2023**

**BPH2C02 – Optics, Laser & Electronics**

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

**Section A- Short Answer Type**

***(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks, Overall Ceiling 20)***

1. Distinguish between optical path and geometrical path.
2. Why are Newton's rings circular ?
3. Draw the intensity distribution curve of Fraunhofer diffraction at a single slit.
4. What are central maxima and principal maxima in the diffraction grating?
5. State Rayleigh's criterion for resolution of spectral lines.
6. What is the difference between unpolarized light and circularly polarized light?.
7. What is the main the difference between positive crystals and negative crystals?
8. Explain any one application of optical activity of plane polarized light.
9. Define Peak Inverse Voltage in a half wave rectifier.
10. Why are Zener diodes used as voltage regulators?
11. Draw the circuit diagram of a NOT gate using transistors.
12. What is metastable state in a laser?

**(Ceiling-20)**

## Section B- Paragraph/ Problem Type

*(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)*

13. Newton's rings are observed in reflected light of $\lambda = 5.9\times10^{-5}$ cm. The diameter of the $10^{th}$ dark ring is 0.5cm. Find the radius of curvature of the lens and the thickness of the air film.
14. Distinguish between resolving power and dispersive power of a grating.
15. A parallel beam of light of wavelength $5460A^0$ is incident at an angle of $30^0$ on a plane transmission grating which has 6000 lines/cm. Find the highest order spectrum that can be observed.
16. Distinguish between quarter wave plate and half wave plate. Explain how plane polarized light is converted to circularly polarized light using wave plates.
17. A sugar solution in a tube of length 20cm produces optical rotation of $13^0$. The solution is then diluted to one-third of its previous concentration. Find the optical rotation produced by 30cm long tube containing the diluted solution.
18. A full wave rectifier uses two diodes, each having internal resistance 20Ω. The transformer r.m.s secondary voltage from centre tap to each end of secondary is 50V and load resistance is 980Ω. Find 1)Mean load current 2)r.m.s value of load current.
19. What are the basic components of a laser system ? Explain.

**(Ceiling- 30)**

## Section C- Essay Type

***Answer any one question. Answer carries 10 marks***

20. Explain interference in plane parallel film due to reflected light and obtain conditions for maximum and minimum intensities.
21. What are different transistor configurations? Explain characteristics of a transistor amplifier in CE configuration.

**(1x10= 10)**

1B2A23096 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Second Semester B.Sc Physics Degree Examination, April 2023**

**BPH2B02 – Mechanics – II**

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

*(The symbols and notations used in this question papers have their usual meanings)*

**Section A- Short Answer Type**

**(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks)**

1. Distinguish between phase velocity and group velocity of waves? Represent each of them in terms of ω and k.
2. Give any two properties of bodies moving under the influence of a central force.
3. Give the differential equation of a two-dimensional wave propagating along a surface. Explain each term in it.
4. Write the condition for standing wave formation. Define a "node".
5. What is the physical origin of Coriolis force? Give any one example.
6. A person stands on the weighing machine placed in an upward accelerating lift. What effect can you note on his apparent weight?
7. How are beats generated? Mention any one of its application.
8. Distinguish the dynamics of an over damped and critically damped oscillator. Give its time dependent graphical representation.
9. What is 'quality factor' of an oscillator? Give its physical relevance.
10. Give the differential equation of a forced harmonic oscillator. Explain each term.
11. Differentiate between dispersive and non-dispersive media. Give one example for each.
12. "Triangular wave sequence is an example for complex wave"- Justify the statement.

**(Ceiling-20 Marks)**

## Section B - Paragraph/ Problem Type

**(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)**

13. A body is freely falling down from a height h at a latitude $\phi$ in the Northern hemisphere. If $\Omega$ is the angular velocity of rotation of earth, compute the horizontal displacement of the body at the latitude.
14. Two functions are given by: a) $y(x,t) = \sin 4x \cos ct$ , b) $y(x,t) = x^2 - c^2t^2$ , where c is a constant. Verify that whether do they represent real wave function.
15. A body having mass of 4 kg executes SHM. 24N force acts on the body when it got displaced to 8cm from its mean position. Find the period. If the maximum velocity is 500cm/sec, compute the amplitude of oscillation.
16. A mechanical wave on a string represented by $y(x,t) = 0.50 \sin(2t - 3x)\, cm$ is reflected back from a rigid surface and superpose with the original wave. Find the amplitude of the resulting standing wave at a distance 2.0cm from the starting point.
17. With necessary theory prove that "*if S frame is inertial then all frames which are in uniform relative motion w.r.t to S are also inertial*".
18. Prove that for a body moving in a central force field, "the areal velocity is a constant".
19. Prepare a brief note on Foucault Pendulum and derive the expression for its time period.

**(Ceiling- 30 Marks)**

## Section C- Essay Type

**(Answer any one question. Answer carries 10 marks)**

20. Derive the general equation of the orbit of a planet put in the central force of sun.
21. With necessary theory, set up the differential equation of a forced (externally driven) damped oscillator and deduce the condition for mechanical resonance.

**(1 x 10 = 10 Marks)**