UG/2nd Sem/Phys/H/19 (Pr.)

2019

B.Sc. (CBCS)

2nd Semester Examination

PHYSICS (Honours)

Paper - C4P

[Practical]

Full Marks : 20 Time : 3 Hours

The figu res in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Answer *one* question.

1. Determine the frequency of an electric tuning fork by Melde's experiment and verify $\left(\lambda^2 - T\right)$ law for either transverse or longitudinal (with respect to length of the thread) vibration of the tuning fork-arm. [Weight of the hanger and mass per unit length of the thread will be supplied]

   (a) Working formula. 2

[Turn Over]

(b) Reading for $\lambda^2 - T$ graph for five different weights on the hanger. 8

(c) Drawing $\lambda^2 - T$ graph. 3

(d) Determination of frequency of the tuning fork from the graph. 2

2. Determine the frequency ratio of two Sinusoidal signals from Lissajous figures with the help of a CRO. [Two function generators are to be provided. Frequency of one function generator will be fixed and unknown to the student : frequency of the other function generator will be adjusted so that the ratio of number of loops along two perpendicular axes are 1:1, 2:3, 1:2, 1:3, 1:4 (or any 5 sets of ratio of small integers given by the examiner]

(a) Theory. 3

(b) Readings for frequency ratio of two sinusoidal signals. 9

(c) Calculation of unknown frequency. 3

3. Find the phase difference of two sinusoidal signals from Lissajous Figures with the help of a CRO.

[Signals of different phases can be obtained with the help of an RC circuit driven by a sinusoidal voltage. Voltage across RC combination and voltage across R can be taken as the two signals. Values of R & C are to be given.]

(a) (i) Working formula for phase difference from Lissajous ellipse. 2

(ii) Wroking formula for phase difference of voltages across RC combination and across R. 2

(b) Circuit diagram and implementation. 2

(c) Readings for phase difference (3 sets for 3 different R) 6

(d) Calculation of practical and theoretical phase differences from formula (i) and (ii) and comparison. 3

4. Investigate the normal modes and resonance of coupled pendulum.

[Two identical compound pendula (rod-mass system) of equal time period suspended from a rigid support

and coupled by an un-stretched horizontal spiral spring are to be used. Spring constant of the given spring will be supplied.]

(a) Working formula. 4

(b) Readings for time periods of (i) in phase oscillation (T_1), (ii) out of phase oscillation (T_2) (iii) beat oscillations (T_C) and (iv) beats (T_B)

[Reading for at least 30 oscillations in each case is to be taken. Least count of the stop watch is to be noted.] 8

(c) Comparison of measured values of T_C and T_B with calculated values. 2

(d) Determination of coupling coefficient. 1

5. Determine the dispersive power of the material of a prism using mercury/helium source.

(a) Working formula. 2

(b) Performing Schuster's focusing (to be verified by the examiner). 2

(c) Readings for deviation of three specified colours of mercury/helium source. (Two extreme colours and the mean colour) 6

(d) Readings for direct rays. 2

(e) Calculation of refractive indices of the three colours and dispersive power. 2+1

6. Determine the Cauchy constants of the material of a prism using mercury/helium source. [Value of minimum scale division and V. C. of spectrometer are to be supplied. Two colours are to be specified and their wavelength will be supplied.]

(a) Working formula. 2

(b) Performing Schuster's focusing (to be verified by the examiner) 2

(c) Readings for deviation of two specified colours of mercury/helium source. 5

(d) Readings for direct rays. 2

(e) Calculation of refractive indices and Cauchy constants. 2+2

[Turn Over]

7. Schuster's focusing be done and determine the angle of given prism.

   (a) Working formula for angle of prism. 2

   (b) Description of minimum deviation, normal & slanting position and Schuster's focusing. 3

   (c) Performing Schuster's focusing (to be verified by the examiner). 2

   (d) Vernier constant of the spectrometer. 1

   (e) Readings for angle of prism. (Take two sets of readings for left to right and right to left movement of the telescope) 6

   (f) Calculation of angle of prism. 1

8. Determine refractive index of the Material of a prism using sodium source. [Angle of prism is to be supplied]

   (a) Working formula. 2

   (b) Description of minimum deviation, normal position, slanting position and Schuster's focusing. 3

(c) Performing Schuster's focusing (to be verified by the examiner) 2

(d) Readings for sodium yellow line with the prism at minimum deviation position. (Take two sets of readings for left to right and right to left movement of the telescope). 4

(e) Readings for direct rays. 2

(f) Calculation of refractive index. 2

9. Determine wavelength of spectral lines of Hg source using plane diffraction grating.

[3 colours are to be specified by the examiner. Number of rulings per mm is to be supplied. V. C. of the spectrometer is to be supplied]

(a) Working formula. 2

(b) Performing Schuster's focusing (to be verified by the examiner). 2

(c) Readings for setting up of the grating surface for normal incidence. 3

[Turn Over]

(d) Readings for deviation of the specified spectral lines (for any one order) 6

(e) Calculation of wavelengths. 2

10. Determine resolving power and dispersive power of a plane diffraction grating. [Number of rulings per mm (m) and number of rulings illuminated by the collimated incident beam (N) are to be supplied, V. C. of the spectrometer is to be supplied.]

(a) Working formula. 2

(b) Performing Schuster's focusing (to be verified by the examiner) 2

(c) Readings for setting up of the grating surface for normal incidence. 3

(d) Readings for deviation of two spectral lines specified by the examiner. (Readings for any two orders, as may be specified by the examiner) 6

(e) Calculation of resolving power and dispersive power. 2

11. Determine the number of rulings per mm of a plane transmission grating. [V. C. of the spectrometer is to be supplied]

    (a) Wroking formula. 2

    (b) Performing schuster's focusing (to be verified by the examiner) 2

    (c) Readings for setting up of the grating surface for normal incidence. 3

    (d) Readings for deviation of sodium yellow line for three orders. (Wavelength will be supplied by the examiner) 6

    (e) Calculation of number of rulings per mm. 2

12. Determine the wavelength of sodium light using Newton's Rings. [Radius of curvature of the convex surface of plano-convex lens and the least count of the micro meter screw are to be supplied]

    (a) Working formula. 2

    (b) Readings for D_m^2 Vs. m (ring number) graph. [Take at least 5 readings] 8

[Turn Over]

(c) Drawing D_m^2 Vs. m graph. 3

(d) Calculation of wavelength from the graph. 2

13. Determine the wavelength of sodium source using Michelson's interferometer.

[Least count of the micrometer screw is to be supplied]

(a) Working formula and principle. 3

(b) Adjustment of the apparatus to obtain sharp circular fringes. (To be verified by the examiner) 2

(c) Readings for the displacement (x) of mirror and number (m) of bright fringes crossing the crosswire. (At least 4 sets of readings for crossing of about 10 fringes in each case) 8

(d) Calculation of wavelength. 2

14. Determine the wavelength of sodium light using Fresnel Biprism. [Separation between the virtual sources and least count of the micrometer is to be supplied]

(a) Wroking formula. 2

(b) Setting up of the apparatus for obtaining fringes and alignment of the apparatus. (To be verified by the examiner) 3

(c) Readings for fringe width at two positions of the eyepiece differing by at least 20 cm. (At each position at least 4 readings with a gap of three fringes in between two readings are to be taken) 8

(d) Calculation of wavelength. 2

LNB - 2, Viva-Voce - 3, Expt. - 15.
