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NBH-003-1012002 Seat No. _____

B. Sc. (Sem. II) (CBCS) Examination

April / May - 2017

Physics : Paper - 102

(New Course)

Faculty Code : 003

Subject Code : 1012002

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.
(2) Give answers of all questions in answer book only.
(3) Figures on the right side indicate full marks.

1 (a) Answer following objective questions : **4**

(1) Velocity of transverse wave in a string is directly proportional to _____.

(2) Which wave travels on a string?

(3) Displacement of the vibrating particle at nodes is always zero.
(True / False)

(4) Which process is responsible for propagation of sound wave in a medium according to Newton?

(b) Answer any one question : **2**

(1) A 4 meter long string of mass 3×10^{-3} kg is tied at one end. If second end is passing over a pulley and carries a weight producing 7.5 N tension on the string. What will be the speed of transverse wave along the string?

(2) Calculate velocity of sound in water. Volume elasticity of water is 2.2×10^9 N/m^2 and density of water is 1000Kg/m^3.

(c) Answer any one question : **3**

(1) Give the laws of transverse vibration.

(2) If the intensity is increased by a factor 20, by how many decibel is the sound level increased ?

(d) Answer any one in detail : **5**

(1) Explain Doppler effect for stationary object and moving source.

(2) Describe the sine wave travelling on a string.

2 (a) Answer following objective questions : **4**

(1) How many P-N junction diodes are required in Center-Tapped Full wave rectifier?

(2) For which rectifier circuit a transformer is needed?

(3) How many P-N junctions are there in the transistor?

(4) In a transistor, Emitter junction is always in _____ biased.

(b) Answer any one question : **2**

(1) A given transistor has α = 0.9. What would be the value of β for the same transistor?

(2) Calculate the ripple factor of a power supply which delivers, V_{dc} = 25 V with an ac component (ripple), V_{rms} = 1 V.

(c) Answer any one question : **3**

(1) Explain construction and working of centre tap Full wave rectifier.

(2) In a common base connection the current amplification factor is (current gain) 0.99. If the emitter current is 10 mA, determine the value of base current.

(d) Answer any one in detail : **5**

(1) What is the Zener diode? Explain its break down and characteristics.

(2) Explain input characteristics of C-B transistor connection.

3 (a) Answer following objective questions : **4**

(1) The central region in Newton's ring is dark. (True / False)

(2) The thin films are coloured due to _____.

(3) Newton's ring illustrates the phenomenon of _____.

(4) The velocity of light is minimum in vacuum. (True / False)

(b) Answer any one question : **2**

(1) Distance between two slits is 0.1 mm and the width of the fringes formed on the screen is 4 mm. If the distance between the screen and the slit is 1 meter, calculate the wavelength of light used.

(2) In a Newton's ring experiment, the diameter of the 17^{th} ring was found to be 0.59 cm and that of the 7^{th} ring was 0.336 cm. If the radius of the plano-convex lens is 1 m, find the wavelength of light used.

(c) Answer any one question : **3**

(1) In case of plane parallel thin film, discuss the Interference due to reflected light.

(2) Newton's ring formed by sodium light between a flat glass plate and a convex lens are viewed normally. What will be the order of the dark ring which will have double the diameter of that of 40^{th} dark ring?

(d) Answer any one in detail : **5**

(1) What is Fresnel's Biprism ? Write it's experimental arrangement.

(2) Derive the formula for the radius of Newton's rings.

4 (a) Answer following objective questions : **4**

(1) How many types of diffraction are? Give the name of diffractions.

(2) The Zone plate behaves like a _____.

(3) Lenses are used in _____ diffraction.

(4) The area of half period zone is equal to _____.

(b) Answer any one question : **2**

(1) A parallel beam of sodium light is allowed to be incident normally on a plane grating having 4250 lines/cm, and a second order spectral line is observed to be derived through 30°. Calculate the wavelength of the spectral line.

(2) In Fraunhoffer diffraction pattern due to a narrow slit a screen is placed 2 m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minima lies 5 mm on either sides of the central maximum then find the wavelength of light.

(c) Answer any one question : **3**

(1) Discuss the theory of zone plate with necessary diagram.

(2) A zone plate has a focal length of 50 cm at a wavelength $7000\,\mathring{A}$. What is its focal length at $\lambda = 5000\,\mathring{A}$?

(d) Answer any one in detail : **5**

(1) Write a short note on plane diffraction grating.

(2) Explain the diffraction pattern of a straight edge.

5 (a) Answer following objective questions : **4**

(1) Dispersive power $\omega =$ _____

(2) Dispersive power is unitless physical quantity. (True / False)

(3) At angle of polarization, the angle between reflected ray and refracted ray is 90°. (True / False)

(4) For which color of light angle of deviation is minimum ?

(b) Answer any one question : **2**

(1) Refractive index of glass is 1.5. Calculate the polarizing angle (Brewster's angle).

(2) Find the angular dispersion produced by a prism from the data : A=20°, μ_v = 1.664 and μ_r = 1.644.

(c) Answer any one question : **3**

(1) State and prove Brewster's law.

(2) Two Nicol prisms are oriented with their principal planes making an angle 60°. What percentage of incident unpolarised light will pass through the system?

(d) Answer any one in detail : **5**

(1) Discuss the Fermat's principle and prove laws of reflection.

(2) Describe the construction and working of a Nicol prism.