FIITJEE INTERNAL TEST

C.B.S.E. TEST – V

PHYSICS

Class – XII

Maximum Marks: 30 **Time Allowed: 1 hour**

General Instructions:

(i) There are 11 questions in all. All Questions are compulsory.

(ii) This question paper has four sections: Section A, Section B, Section C and Section D.

(iii) Section A contains four questions of two marks each, Section B contains two questions of three marks each, Section C contains two question of five mark each. In Section D contains one case study (paragraph) having 3 questions objective single correct option two marks each question.

(iv) You may use log tables if necessary but use of calculator is not allowed.

SECTION-A

1. The geometrical shape of the wavefront when a plane wave passes through a convex lens is _____.

2. A convex lens is placed in contact with a plane mirror. A point object at a distance of 20 cm on the axis of this combination has its image coinciding with itself. The focal length of the lens is _____.

3. In a series LCR circuit, the voltage across an inductor, capacitor and resistor are 20 V, 20 V and 40 V respectively. The phase difference between the applied voltage and the current in the circuit is _____.

4. Find the radius of curvature of the convex surface of a plano convex lens, whose focal length is 0.3m and the refractive index of the material of the lens is 1.5?

SECTION-B

5. A parallel plate capacitor, each with plate area A and separation d, is charged to a potential difference V. The battery used to charge is disconnected and a dielectric is kept between the plates. What change will take place if any, in
(i) Charge on plates
(ii) Electric field intensity
(iii) capacitance

6. A double slit of separation 0.1 cm is illuminated by white light. A coloured interference pattern is formed on a screen 100 cm away. If a pin hole is located on this screen at a distance of 4.0 mm from the central white fringe, what wavelength within the visible spectrum will be absent in the light emitted through the hole? Wavelength in the visible spectra lie between 3500 – 7000 Å?

OR

(a) Derive the expression for the position of interference fringes.

(b) Find fringe width.

SECTION-C

7. (a) How does one demonstrate, using a suitable diagram that unpolarised light when passed through a Polaroid gets polarized.

(b) A beam of unpolarised light is incident on a glass-air interface. Show, using a suitable ray diagram, that light reflected from the interface is totally polarized, when $\mu = \tan i_B$, where μ is the refractive index of glass with respect to air and i_B is the Brewster's angle.

8. (a) (i) 'Two independent monochromatic sources of light cannot produce a sustained interference pattern'. Give reasons.

(ii) Light waves each of amplitude "a" and frequency "ω", emanating from two coherent light sources superpose at a point. If the displacements due to these waves is given by $y_1 = a\cos\omega t$ and $y_2 = a\cos(\omega t + \phi)$ where ϕ is phase difference between the two, obtain the expression for the resultant intensity at the point.

(b) In Young's double slit experiment, using monochromatic light of wavelength λ, the intensity of light at a point on the screen where path different is λ is K units. Find out the intensity of light at a point where difference is $\lambda/3$.

SECTION-D
Paragraph Based Questions

When two waves emitted by two coherent sources travelling in same direction superpose on each other the redistribution of energy takes place in the form of maxima at some points and minima at other points called interference:

9. Which of the following statements is not correct for coherent sources of light?

(A) Two sodium lamps emitting light of same wavelength i.e., monochromatic light are coherent.

(B) Two virtual images of any source are coherent.

(C) One source and other its virtual image are coherent.

(D) Same wave front reflected from interface of two different media are coherent.

10. Two independent sources of light emitting same intensity I_0 will have intensity on interference as:

(A) maxima $4I_0$.

(B) maxima $2I_0$ and minimum zero.

(C) minimum zero.

(D) intensity is uniform equal to $2I_0$ at every point.

11. If sources are coherent but intensities are different as I_1 and I_2, then out of the following which are correct statements?

(i) Average intensity at every point is $I_1 + I_2$

(ii) Intensity at maxima is more than $I_1 + I_2$ and at minima is more than $I_1 - I_2$

(iii) Intensity at maxima is $I_1 + I_2 + 2\sqrt{I_1 I_2}$

(iv) Conservation of energy is valid

(A) All are correct

(B) (i), (ii), (iv) are correct

(C) (iii), (iv) are correct

(D) (ii), (iii), (iv) are correct