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Experiment 5: Newton's Ring

1) Write any one application based on this experiment related to your core engineering branch.

Ans 1) Newton's ring in optics are a series of concentric light and dark coloured bands observed between two pieces of glass when one is convex and rest on its convex side on another piece having a flat surface.

2) An important application of Newton ring experiment is in determination of wavelength of light. Wavelength based computing is an unconventional approach to optical computing.

3) Optical computing or photonic computing use photons produced by lasers or diodes for computation. For decades, photons have shown promise to enable a higher bandwidth than electrons used in conventional computers. Most research projects focus on replacing current computer components with optical equivalents, resulting in an optical digital computer system processing binary data.

4) Wavelength based computing can be used to solve the 3-SAT problems with n-variables, m clauses and with no more than 3 variables per clause.

5) Each wavelength, contained in a light ray is considered as a possible value assignments to n-variables.

6) The optical device contains prisms and mirrors are used to discriminate proper wavelengths which satisfy the formula.

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2) Explain any other technique or experiment other than the one performed which will achieve the result and fulfil the aim of experiment.

Ans 1) This method involves Indentifying a clearly visible dark fringe and calculating the thickness of air film creating the path difference causing formation of the dark fringe.

2) The formula is $(R - t_{15})^2 + r_{15}^2 = R^2$

where R is radius of curvature, t is thickness and r is radius of ring.

3) Simplification yields

$$\frac{R t_{15}^2 + r_{15}^2}{2 t_{15}}$$

4) $t = \frac{n\lambda}{2}$, for 15th dark fringe $\therefore n = 15$

$$t_{15} = (15 \times 5896 \times 10^{-10})/2 = 4.22 \times 10^{-6} \text{ m.}$$

$$r_{15} = 2.90 \times 10^{-3} \text{ m}$$

5) Substituting the values of t_{15} and r_{15} in equation (i),

$$R = \frac{(4.22 \times 10^{-6})^2 + (2.90 \times 10^{-3})^2}{8.844 \times 10^{-6}}$$

$$R = 0.95 \text{ m.}$$

6) It may be noted that the radius of curvature obtained through this method (0.95m) is in close arrangement with the result obtained through general method.