

Con. 5848-13.

GX-10130

(REVISED)

(2 Hours)

[ Total Marks : 60

- N.B. :** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **three** questions from Q.no. 2 to Q.no. 6.  
 (3) Assume **suitable** data and **symbol** if required.  
 (4) **Figures** to the right indicate full **marks**.

1. Attempt any **five** : -
- |        |  |   |
|--------|--|---|
| (a)    | Explain why an extensive thin film appears black in reflected light ?  | 3 |
| (b)    | How will you increase the resolving power of a diffraction grating ?   | 3 |
| (c)    | Calculate the numerical aperture of a fiber with core index $n_1 = 1.01$ and cladding index $n_2 = 1.55$   | 3 |
| (d)    | What is the difference between spontaneous and stimulated emissions.   | 3 |
| (e)    | An electron is bound by a potential which closely approaches an infinite square well of width $2.5 \times 10^{-10}$ m. Calculate first lowest permissible energy for electron.   | 3 |
| (f)    | Write any two applications of CRO.   | 3 |
| (g)    | What is MAGLEV ?   | 3 |
| 2. (a) | What do you understand by anti reflection coating ? Derive the conditions with proper diagram.   | 8 |
| (b)    | What is N.A. ? Consider a multimode step under fibre with $n_1 = 1.53$ and $n_2 = 1.50$ and $x_2 = 1$ m. If the core radius = 50pm than calculate the realised frequency of the fibre (V) and the number of guided mode. | 7 |
| 3. (a) | What is the difference between holography and photography ? Discuss the construction and reconstruction of image in holography with neat diagram   | 8 |
| (b)    | Derive the conditions for maxima and minima due to interference of light reflected from thin film of uniform thickness.  | 7 |
| 4. (a) | What is the highest order spectrum which can be seen with monochromatic light of wavelength $6000 \text{ \AA}$ by means of a diffraction grating with 5000 lines / cm.   | 5 |
| (b)    | Explain the Heisenberg's uncertainty principle.  | 5 |
| (c)    | What are Type I and Type II superconductors ?  | 5 |
| 5. (a) | A plane grating just resolve two lines in the second order. Calculate the grating element if $d \lambda = 6 \text{ \AA}$ , $\lambda = 6 \times 10^{-5}$ cm and the width of the ruled surface is 2cm.                    | 5 |
| (b)    | Derive Schrödinger's time dependent wave equation.   | 5 |
| (c)    | Explain the working of SEM with a neat diagram.  | 5 |
| 6. (a) | Find the energy of the neutron in units of electron volts where De-broglie wavelength is $1 \text{ \AA}$   | 5 |
|        | mass of neutron = $1.674 \times 10^{-27}$ kg   |   |
|        | Planck's constant = $6.620 \times 10^{-34}$ J.secs   |   |
| (b)    | Write a short note on electrostatic focussing.   | 5 |
| (c)    | What are carbon tubes and what are their properties.   | 5 |
-