

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 $n_2 = 1.55$ $n_2 = 1.55$ (1.61) 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 $2.5 \times 10^{-10} \text{m}$. 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 $\lambda = 1 \mu\text{m}$. If the core radius = $50 \mu\text{m}$ then calculate the realised frequency of the fibre (V) and the number of guided mode. normalized
 $\lambda = 1 \mu\text{m}$
 $\lambda = 1 \text{ micrometer}$

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 \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 $d \lambda = 6 \text{ \AA}$, $\lambda = 6 \times 10^{-5} \text{cm}$ and the width of the ruled surface is 2cm. 5

(b) Derive Schrodinger'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 \AA 5

$$\text{mass of neutron} = 1.674 \times 10^{-27} \text{kg}$$

$$\text{planck's constant} = 6.620 \times 10^{-34} \text{ J.secs}$$

(b) Write a short note on electrostatic focussing. 5

(c) What are carbon tubes and what are their properties. 5