(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 aparture of a fiber with core index n_1 = 1.01 and   3
         cladding index n_2 = 1.55
    (d) What is the difference between spontaneous and stimulated emissions.   3
    (e) An electron is bound by a potential which closely approaches an infinite   3
         sqaure well of width 2.5×10^{-10}m. Calculate first lowest permissible energy
         for electron.
    (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   8
         proper diagram.
    (b) What is N.A. ? Consider a multimode step under fibre with n_1 = 1.53 and n_2 =   7
         1.50 and λ = 1μm. If the core radius = 50μm than calculate the normalized frequency
         of the fibre (V) and the number of guided mode.

3. (a) What is the difference between holography and photography ? Discuss the   8
         construction and reconstruction of image in holography with neat diagram
    (b) Derive the conditions for maxima and minima due to interference of light reflected   7
         from thin film of uniform thickness.

4. (a) What is the highest order spectrum which can be seen with monochromatic light   5
         of wavelength 6000 A° by means of a diffraction grating with 5000 lines / cm.
    (b) Explain the Hesenberg's uncertainty principle.   5
    (c) What are Type I and Type II superreconductors ?   5

5. (a) A plane grating just resolve two lines in the second order. Calculate the grating   5
         element if d λ = 6A°, λ = 6×10^{-5cm} and the width of the ruled surface is 2cm.
    (b) Derive shrodingers 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   5
         wavelemgth is 1 Å
                   mass of neutron   = 1.674×10^{-27}kg
                   planck's constant = 6.620×10^{-34} J.sees
    (b) Write a short note on electrostatic forcussing.   5
    (c) What are carbon tubes and what are their properties.   5