

B. TECH, B. TECH + MBA DUAL DEGREE PROGRAMMES (CSE, IT, CE, ECE, MAE, E & EE, E & I, AE, NS & T, S & AE, FOOD TECH), B. TECH (MAE) + M. TECH (AUTOMOBILE) - DD, B. TECH (AE) + M. TECH (AVIONICS) - DD, B. TECH + M. TECH (NS & T) - DD & B. TECH (CSE, ECE, MAE) - EVENING

SECOND SEMESTER END TERM EXAMINATION :
APRIL, 2014

APPLIED PHYSICS - II

Time : 3 Hrs.

Maximum Marks : 70

Note: Attempt questions from all sections as directed.

SECTION - A (30 Marks)

Attempt any 5 questions.

Each question carries 6 marks.

1. (a) Write postulates of special theory of relativity. (3)
- (b) A rod of length 1 metre kept in a satellite moving with velocity $0.8 C$ relative to laboratory. What will be the length of rod as determined by an observer in the lab frame? (3)

P.T.O.

2. (a) What do you understand by matter waves. Calculate the De Broglie wavelength of an electron accelerated through a potential difference of 100 volts. (4)
- (b) Give physical interpretation of wave function ψ . (2)
3. (a) Find out all possible values of J for p-d system of electrons using L-S coupling. (4)
- (b) Explain why population inversion is essential for laser action to take place. (2)
4. (a) Explain Mosky's law and discuss its importance. (3)
- (b) The spacing between principle planes of NaCl crystal is 2.82 Å. It is observed that first order Bragg reflection occurs at an angle of 10° . Calculate the wavelength of x-ray. (3)
5. Describe Vector atom model. Calculate the possible orientations of atom with $\ell = 2$, placed in a magnetic field pointing along z-dir $^\circ$.
6. (a) Derive the relation between V_g and V_p for a dispersive medium, where V_g and V_p are the group and phase velocity respectively. (3)
- (b) Explain Heisenberg uncertainty principle. (3)

SECTION - B (20 Marks)

Attempt any two questions.

Each question carries 10 marks.

7. (a) If two particles are moving in opposite direction along x-axis with a speed of $0.7 C$, calculate their relative speed. (4)
- (b) Derive the Einstein's mass energy relation $E = mc^2$. (6)
8. (a) An electron is trapped in an infinite potential well. Find the corresponding energy states and wave function. (6)
- (b) Using uncertainty principle prove that electron can't exist inside the nucleus. (4)
9. (a) Give construction and working of Ruby laser. (5)
- (b) Show that the mean energy of an electron is $3/5$ of the Fermi energy at OK. (5)

SECTION - C (20 Marks)

(Compulsory)

10. (a) What do you mean by superconductivity? Discuss the effect of the magnetic field on the Superconducting state of type I and type II Superconductor. (5)

- (b) Calculate the energy difference between the ground state and first excited state for an electron in a box of length 1\AA . (5)
- (c) Describe Michelson and Morley experiment and explain the significance of its negative result. (6)
- (d) Show that the relation between the momentum p and energy E of a relativistic particle is given by $E^2 = p^2c^2 + m_0c^4$, where c is the speed of light and m_0 is the rest mass of electron. (4)