



AC-3075

B. Sc. (Sem. IV) Examination

April / May - 2015

Physics (For Electronics) : Paper - IV
(Quantum Mechanics & Laser)

Time : Hours]

[Total Marks :

Instructions :

(1)

नीचे दृष्टावेक निशानीवाणी विगतो उत्तरवही पर अवश्य कपवी.
Fillup strictly the details of signs on your answer book.

Name of the Examination :
B. SC. (SEM. - IV)

Name of the Subject :
PHYSICS (FOR ELECTRONICS) : PAPER - IV

Subject Code No. : 3 0 7 5 Section No. (1, 2,.....): Nil

Seat No. :

Student's Signature

- (2) Figures to the right indicate the total marks carried by the question.
- (3) Symbols used in the question paper have their usual meanings.
- (4) Students can use non-programmable scientific calculator, if required.
- (5) $m_e = 9.1 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C,

$$h = 6.62 \times 10^{-34} \text{ Js.}, \quad \epsilon_0 = 8.85 \times 10^{-12} \frac{\text{C}^2}{\text{Nm}^2}$$

Q:1 Answer the following in brief. (Any eight). (8)

- (1) State the features of Rutherford's atomic model.
- (2) Define excitation.
- (3) Give full form of LASER.
- (4) What is transverse velocity of electron?
- (5) What is an angular quantum number?
- (6) What is a gain constant?
- (7) Which was the first successful laser?
- (8) State any two properties of laser.
- (9) What do you mean by population inversion?
- (10) State Bohr's second hypothesis.

Q:2 (A) State Bohr's first hypothesis. Using it, derive an equation for the radius of electron orbit in hydrogen atom. (10)

- (B) Calculate the orbital angular momentum of electron in hydrogen atom in its first excited state. (4)

OR

- Q:2 (A) Add correction for the finite mass of the nucleus of hydrogen atom to the Bohr's theory and derive an equation for total kinetic energy of electron. (10)

- (B) The fine structure constant appearing in Sommerfeld's theory is given by $= \frac{e^2}{2\epsilon_0 hc}$. Show that it is a unitless and dimensionless quantity. (4)

- Q:3 (A) Explain spontaneous and stimulated emission and derive equations among the Einstein's coefficients. (10)

- (B) Explain the principle of laser. (4)

OR

- Q:3 (A) Explain the construction and working of He-Ne laser. (10)

- (B) Write a short note on applications of laser. (4)

- Q:4 Write short note on any two of the following. (14)

- (i) Cavity resonance
- (ii) Ruby laser
- (iii) Matter waves
- (iv) Spectral series observed for hydrogen atom