



JB-3159

B. Sc. (Sem. IV) Examination

April/May – 2013

Applied Physics : Paper - IV

(Quantum Mechanics & Laser)

(New Course)

Time : Hours]

[Total Marks : 50

Instructions :

(1)

નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
B. SC. (SEM. 4)	<input type="text"/>
Name of the Subject :	<input type="text"/>
APPLIED PHYSICS : PAPER - 4 (NEW COURSE)	<input type="text"/>
Subject Code No. : <input type="text"/> 3 <input type="text"/> 1 <input type="text"/> 5 <input type="text"/> 9	<input type="text"/>
Section No. (1, 2,.....): <input type="text"/> Nil	
	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

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

- 1 Answer the following in brief : (any eight) 8
- (i) Define ionization energy.
- (ii) What is a stationary orbit of an electron ?
- (iii) What is reduced mass ?
- (iv) Define critical potential.
- (v) What is a radial quantum number ?
- (vi) Give full form of MASER.
- (vii) Who introduced the concept of stimulated emission first ?
- (viii) State any two methods of achieving population inversion.
- (ix) State any two properties of laser.
- (x) State the main components required for lasing action.

2 (a) State Bohr's first hypothesis. Derive an equation for the mechanical energy of electron orbit of hydrogen atom on the basis of Bohr's theory. 10

(b) Calculate the orbital velocity of electron in hydrogen atom in its ground state. 4

OR

2 (a) Explain the experimental arrangements of Stern-Gerlach experiment. Give their experimental observations also. 10

(b) The fine structure constant appearing in Sommerfeld's theory is given by $= \frac{e^2}{2\epsilon_0 hc}$. Calculate its value. 4

3 (a) Explain spontaneous and stimulated emission and derive equations among the Einstein's coefficients. 10

(b) Calculate mean spontaneous life time of the upper level for $2P \rightarrow 1S$ transition in an element, given that $A=6 \times 10^8 \text{ s}^{-1}$. 4

OR

3 (a) Explain the construction and working of ruby laser. 10

(b) Explain the principle of laser. 4

4 Write short note on any two of the following : 14

(i) Drawbacks of Bohr's and Sommerfeld's atomic models.

(ii) Space quantization

(iii) Various methods of getting population inversion

(iv) Applications of lasers.