

Roll No.....

Total No. of Questions : 05

Total No. of Printed Pages : 03

Code No. : B-266(B)

Annual Examination - 2017

B.Sc. - III

PHYSICS

Paper - I

RELATIVITY, QUANTUM MECHANICS &  
NUCLEAR PHYSICS

Max.Marks : 50

Time : 3 Hrs.

Min.Marks : 17

Note : Attempt one question from each unit. All questions carry equal marks.

Unit-I

Two frames S and S' are moving with constant velocity  $v$  relative to each other. Show that if  $v \ll c$ , the Lorentz transformations reduce to the Galilean transformations. (8)

Deduce Lorentz transformation equations for two frames moving with constant velocity relative with each other. Show that if  $v \ll c$ , the Lorentz transformations reduce to the Gallilean transformations.

What are the postulates of special theory of relativity? (2)

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OR

What is Compton effect? Prove that the expression for Compton shift is  $\Delta\lambda = \frac{h}{m_0 c} (1 - \cos \phi)$  for scattering angle  $\phi$ . Where the symbols have their usual meaning. (8)

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P.T.O.

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1/2c/2æ0; eku Å t k I Ecl/k D; k gS

(2)

What is mass energy equivalence relation?

**Unit-II**

ç'u 2- i zdk'k fo | r i Hkko D; k gS bl dksvkbULVhu Dok. Ve fl ) kUr dsvk/kkj ij l e>kb; A (10)

What is photoelectric effect? Explain it on the basis of Einstein's Quantum theory.

**OR**

gkbtucxl ds vfuf' prrk I Ecl/kka dksfyf[k; s, oa bl dh l gk; rk l sxkek fdj.k I en' kiz dks l e>kb; A (10)

Write down Heisenberg's uncertainty principle and explain  $\gamma$  - ray microscope with its help.

**Unit-III**

ç'u 3- JkSMaj rjx l ehdj. kq dkykfJr rFkk dkykukfJr dksuxfer dhft, A(6) l os p rFkk Å t k I E dsfy, l dkjd i ktr dhft, A (4)

Derive time dependent and time independent Schrodinger wave equation. Derive expressions for operators p (momentum operator) and operator E (energy operator).

**OR**

vk; rkdj foHko ikphj ds fy, JkSMaj l ehdj.k dks gy dhft, rFkk foHkUu flFkr; ka e i jkor Drk rFkk ikjxeurk dk 0; atd i ktr dhft, A(9) l jaxu i Hkko D; k gS (1)

Solve Schrodinger equation for a rectangular potential barrier and determine expressions for transmission and reflection co-efficients for different conditions.

What is tunneling effect?

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**Unit-IV**

ç'u 4- gkbMkst u rFkk M; wku ijek.kq/ka ds o.kDe ea D; k vrj gS. 0; k[; k dhft, A (5)

{kkjh; /kkq/ka ds o.kDe dh 0; k[; k dj rsgq l kSM; e D j[kk dh l e l j puk dks l e>kb; A (5)

How does the spectrum of hydrogen differ from deuteron? Explaining the spectrum of alkali metals discuss the fine structure of sodium D lines.

**OR**

jeu i Hkko D; k gS jeu Li DVk dks i h dh i k; kSxd 0; oLFkk dks l e>kb; A jeu i Hkko dh Dok. Ve 0; k[; k dhft, A (10)

What is Raman Effect? Give its experimental details. Explain it with the help of quantum theory.

**Unit-V**

ç'u 5- xkboxj eyj x.kd dh l j puk rFkk dk; fof/k l e>kb; s rFkk xkboxj eyj x.kd eaer & 'khyu dS si ktr dj rsgS. (8)

ukfkkdh; l d pd D; k gksrsgS (2)

Explain the construction and working of GM counter. How is the cooling of GM counter obtained?

What are the nuclear detectors?

**OR**

; kSxd ukfkkd dh vo/kkj.kk l e>kb; A bl dsmngkj.k nhft, A (8)

ukfkkd dsprdkph vk?kwiz dsfy, 0; atd i ktr dhft, A (2)

Describe the of compound nucleus and give its example.

Derive the expression for quadrupole moment.

---X---