

**First/Second Semester B.E. Degree Examination, June/July 2013**  
**Engineering Physics**

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, choosing at least two from each part.

2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.

3. Answer to objective type questions on sheets other than OMR will not be valued.

4. Physical Constants : Planck's constant,  $h = 6.63 \times 10^{-34}$  Js, Electron charge,  $e = 1.6 \times 10^{-19}$  C  
Electron mass,  $m = 9.11 \times 10^{-31}$  kg, Velocity of light,  $C = 3 \times 10^8$  mS<sup>-1</sup>**PART - A**

- 1 a. Choose the correct answers for the following : (04 Marks)
- If red and blue stars emits radiations of continuous wavelengths, then according to Wien's displacement law.  
 A) Blue star is hotter than red star  
 B) Red star is hotter than blue star  
 C) Both stars are at same temperature  
 D) Difficult to conclude.
  - The expression for de-Broglie wavelength for an electron under an accelerating potential V is,  
 A)  $\frac{12.26}{\sqrt{V}}$  m  
 B)  $\frac{12.26}{\sqrt{V}}$  Å  
 C)  $\frac{12.26}{\sqrt{V}}$  nm  
 D)  $\frac{12.26}{\sqrt{V}}$  µm
  - A particle moves with velocity  $3 \times 10^8$  ms<sup>-1</sup>. The wavelength associated with it is 1 nm. Then group velocity of the particle is,  
 A)  $3 \times 10^8$  mS<sup>-1</sup>  
 B)  $3 \times 10^{10}$  mS<sup>-1</sup>  
 C)  $3 \times 10^6$  mS<sup>-1</sup>  
 D)  $1.5 \times 10^6$  mS<sup>-1</sup>
  - According to the Compton effect, the wavelength of X-rays scattered at an angle greater than zero,  
 A) Decreases  
 B) Doesn't change  
 C) Increases  
 D) None of these
- b. Derive an expression for group velocity on the basis of superposition of waves. Also obtain the relation between group velocity and phase velocity. (08 Marks)
- c. Show that Planck's law reduces to Wien's law and Rayleigh-Jeans law under certain conditions. (05 Marks)
- d. Calculate the de-Broglie wavelength associated with an electron of energy 1.5 eV. (03 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- The energy of the lowest state in one dimensional potential box of length  $a = 1$  unit is,  
 A)  $\frac{h^2}{8m}$   
 B) zero  
 C)  $\frac{h^2}{4ma^2}$   
 D)  $\frac{h^2}{2ma^2}$
  - For a particle which is not bound to any system and is free, the energy eigen value is,  
 A) zero  
 B) finite but not quantized  
 C) infinity  
 D) finite but quantized
  - If the uncertainty in the position of a particle is equal to its de-Broglie wavelength then uncertainty in its momentum will be,  
 A)  $\Delta P \geq \frac{h}{4\pi}$   
 B)  $\Delta P \geq \frac{h}{2\pi}$   
 C)  $\Delta P \geq \frac{P}{4\pi}$   
 D)  $\Delta P \geq \frac{h}{P}$
  - For an electron to be present inside the nucleus of an atom the uncertainty in the position of the electron must be,  
 A) more than or equal to the radius of the nucleus  
 B) more than or equal to the diameter of the nucleus.  
 C) more than the diameter of the nucleus  
 D) less than or equal to the diameter of the nucleus.



# June 2013 Physics 97paper 22 Question

**Daniel F McAuley**



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## **Table of Contents June 2013 Physics 97paper 22 Question**

1. Understanding the eBook June 2013 Physics 97paper 22 Question
  - The Rise of Digital Reading June 2013 Physics 97paper 22 Question
  - Advantages of eBooks Over Traditional Books
2. Identifying June 2013 Physics 97paper 22 Question
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an June 2013 Physics 97paper 22 Question
  - User-Friendly Interface
4. Exploring eBook Recommendations from June 2013 Physics 97paper 22 Question
  - Personalized Recommendations
  - June 2013 Physics 97paper 22 Question User Reviews and Ratings
  - June 2013 Physics 97paper 22 Question and Bestseller Lists

5. Accessing June 2013 Physics 97paper 22 Question Free and Paid eBooks
  - June 2013 Physics 97paper 22 Question Public Domain eBooks
  - June 2013 Physics 97paper 22 Question eBook Subscription Services
  - June 2013 Physics 97paper 22 Question Budget-Friendly Options
6. Navigating June 2013 Physics 97paper 22 Question eBook Formats
  - ePub, PDF, MOBI, and More
  - June 2013 Physics 97paper 22 Question Compatibility with Devices
  - June 2013 Physics 97paper 22 Question Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of June 2013 Physics 97paper 22 Question
  - Highlighting and Note-Taking June 2013 Physics 97paper 22 Question
  - Interactive Elements June 2013 Physics 97paper 22 Question
8. Staying Engaged with June 2013 Physics 97paper 22 Question
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers June 2013 Physics 97paper 22 Question
9. Balancing eBooks and Physical Books June 2013 Physics 97paper 22 Question
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection June 2013 Physics 97paper 22 Question
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine June 2013 Physics 97paper 22 Question
  - Setting Reading Goals June 2013 Physics 97paper 22 Question
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of June 2013 Physics 97paper 22 Question
  - Fact-Checking eBook Content of June 2013 Physics 97paper 22 Question
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks
- 14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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