NATIONAL INSTITUTE OF TECHNOLOGY GOA

Programme Name: B.Tech
Minor-1 Examination, March -2021

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Course Name: Physics	**Course Code: PH100**
Date: 24.03.2021	**Time: 8.30 AM**
Duration: 1 Hour	**Max. Marks: 25**

ANSWER ALL QUESTIONS

1. Solve the following problems using Maxwell-Boltzmann statistics, Bose-Einstein statistics and Fermi-Dirac statistics (Find the number of ways we can arrange the particles in a given cells)   (5M)
   i) Three Particles and three Cells
   ii) Three Particles and four Cells
   iii) Four Particles and three Cells
   iv) Ten Particles and thirteen Cells
   v) Eight Particles and nine Cells

2. Write the most probable microstate for Bose-Einstein statistics and derive the Bose-Einstein distribution in the form of $f(E)_{BE} = \frac{1}{e^{\alpha+\beta\varepsilon_i}-1}$ for a system of indistinguishable Bosons.   (5M)

3. What is an infinite potential well? Obtain Schrodinger's time independent wave equation. Solve it for particles in a one dimensional cubical box of a side 'a', and hence obtain expressions for the allowed wave functions and discrete energy values of the particle.   (4M)

4. The normalized wave function for certain particle is $\Psi(x) = \sqrt{\frac{3}{\pi}}cosx , -\frac{\pi}{2} < x < \frac{\pi}{2}$. Calculate the probability of finding the particle between $0 < x < \frac{\pi}{4}$ (3M)

5. A particle of total energy E is moving in a one dimensional potential is given by

   $V(x) = 0 \; for \; x < 0$
   $V(x) = V_0 \; for \; x > 0$
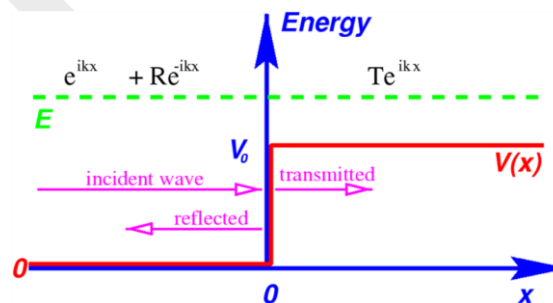
   Calculate the reflection and transmission coefficients for the case $E > V_0$ (5M)

6. If a beam of electrons impigns on any energy barrier of height 0.25 eV and of infinite width, find the fraction of electrons reflected and transmitted at the barrier if the energy of impigning electrons:
   (i) 0.30 eV (ii) 0.25 eV   (3M)

***All the best ***