Final Assessment Test – Jan / Feb 2023

VIT
Vellore Institute of Technology

Course: BPHY101L - Engineering Physics
Class NBR(s): 5753/5776/5804/5819/5862/5872/ 5877/5881
Time: Three Hours

Slot: E2+TE2
Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE

General Instructions:

1) **Useful constants: 1 eV = 1.6×10^{-19} J**
2) **Mass of electron = 9.1×10^{-31} kg**
3) **Mass of neutron = 1.67×10^{-27} kg**
4) **Planck's constant = 6.626×10^{-34} Js**

Answer any TEN Questions
(10 X 10 = 100 Marks)

Deduce the expression for the velocity of transverse waves on a long stretched string.

Write the expression for reflection and transmission coefficient for the transverse wave on a string when there is a sudden change in the impedence at the boundary. [5]

A string attached in piano produces a frequency of 400 Hz. If the linear mass density of the string is 0.020 kg/m, estimate the wavelength of the standing waves and the speed of the waves on the string. Consider the tension on the wire to be 7.0 N. [5]

"Light is a form of EM wave". Verify on the light of Maxwell's equation using suitable mathematical arguments. What is the nature of these waves? What are the plane wave solution for the variation of E and B?

Discuss an experiment which confirms both de Broglie hypothesis and wave nature of electron.

5. a) Why are x-ray used in the Compton experiment, rather than visible light? Justify mathematically. [5]

The atomic spacing in rock salt, NaCl, is 0.282 nm. Find the kinetic energy (in eV) of a neutron with de Broglie wavelength of 0.282 nm. Is a relativistic calculation needed? Explain. [5]

With necessary theory and applying boundary conditions, find out the eigen value and eigen functions for a particle trapped in a one dimensional potential well. Also plot the variation in energy for the first three energy levels. [6+4]

What is quantum confinement? List the classification of nanoparticles based on this with proper schematic and example for each case. Also sketch their variation of density of states.

Design an Nd-YAG laser specifying the various components using a neat diagram. Discuss the working using energy level diagram.