School of Advanced Sciences
DEPARTMENT OF PHYSICS

Mid Term Test (MTT)

Tech – Fall Semester-2020-21

Course: PHY1701- Engineering Physics

Duration: 90 mins **Max Marks: 60** **Slot: D1+TD1**

Class NBR: VL2020210105402 **SET 2**

Part – A (10x 6 = 60) Answer All Questions

- *Draw diagrams wherever necessary*

1	If a proton is substituted in place of electron in the Compton effect, then discuss Compton shift for various angles. Compare the Compton effect with proton and that of electron.	**6**	**CO1**
2	Mention the canonical conjugate pairs and using which explain Heisenberg's uncertainty principle. Justify the principle from the wave point of view.	**6**	**CO1**
3	It is known that the nucleus of an atom is of the order of $10^{-14}\ m$ in diameter. For an electron to be confined to a nucleus, its de Broglie wavelength would have to be on this order of magnitude or smaller. What would be the kinetic energy of an electron confined to this region? Would you expect to find an electron in a nucleus? Explain.	**6**	**CO1**
4	Obtain the expression for the energy as well as Eigen function relating to a particle that is confined in a one-dimensional box of finite width. Sketch the wave function and probability density for each level, starting from $n = 1$ to 4.	**6**	**CO2**
5	An alpha particle of energy $10\,MeV$ is incident on a potential barrier of height $30\,MeV$. Calculate the width of the potential barrier so that transmission coefficient is 2×10^{-3}.	**6**	**CO2**
6	Establish that intermodal dispersion increases with length of the fiber.	**6**	**CO6**
7	If x is the distance between the output end of the optical fiber and the screen and w is the diameter of the output beam on the screen, then find the expression for numerical aperture and acceptance angle.	**6**	**CO6**
8	Calculate the numerical aperture, acceptance angle, critical angle of a fiber with a core refractive index 1.5 and cladding index 1.46. Also determine the modal dispersion if the length of the fiber is 1 m.	**6**	**CO6**
9	Explain the reasons with diagram for having intrinsic region in PiN photodetector.	**6**	**CO7**
10	PN photodiode has a quantum efficiency of 65% for photon of energy 1.52 x 10^{-19} J. (i) Find the wavelength at which the diode can be operated. (ii) Find the optical power required to achieve a photo current of 2 μA with the wavelength of the incident photon calculated in (i).	**6**	**CO7**