Doc. No.: FY-ACAD-33(a)	**Shri Ramdeobaba College of Engineering and Management, Nagpur - 440 013**	**Iss. No.: 01** **Rev. No.: 00**
Clause No.: 9.1		**Date of Rev.: 01/01/2018**
Department: Physics	**Name of Internal Examination: Test-1** **Session: 2020-21 Semester: II [AI&ML, Cyber Security]**	**Page 1/1**
Course Code: PHT154 **Course Name: Introduction to Quantum Computing**		**Date of Exam: 02-8-2021** **Timing:1.00pm to 2.00pm**
Maximum Marks: 15		**Duration: 1 Hrs**

Note: All questions are compulsory. Draw suitable diagrams.

Q.No.	Question	Marks	COs Mapped
1.	Show that: (i) Matrix multiplication respects scalar multiplication. (ii) Matrix multiplication relates to transpose. Use: A = $\begin{bmatrix}1 & -2\\2 & 4\end{bmatrix}\begin{bmatrix}1 & -2\\2 & 4\end{bmatrix}$, B= $\begin{bmatrix}-3 & 2\\0 & 4\end{bmatrix}\begin{bmatrix}-3 & 2\\0 & 4\end{bmatrix}$, c = 3.	**3**	**CO-1**
2.	Find whether the set of vectors given by B, is linearly independent or not. B= $\{[1,2,3]^T, [3,0,2]^T, [1,-4,-4]^T\}$.	**2**	**CO-1**
3.	Given the operator matrix: A= $\begin{bmatrix}3 & -2\\7 & -6\end{bmatrix}\begin{bmatrix}3 & -2\\7 & -6\end{bmatrix}$. Two vectors are given. $V_1= [2,7]^T$ and $V_2= [1,1]^T$. Find whether the operator A is the eigen value operator of the given vector(s). Find the corresponding eigen values.	**2**	**CO-1**
4.	Define Tensor product. Show that tensor product is commutative. A = $\begin{bmatrix}1 & -2\\2 & 4\end{bmatrix}\begin{bmatrix}1 & -2\\2 & 4\end{bmatrix}$, B= $\begin{bmatrix}-3 & 2\\0 & 4\end{bmatrix}\begin{bmatrix}-3 & 2\\0 & 4\end{bmatrix}$.	**2**	**CO-1**
5.	Why a single monochromatic wave cannot represent a particle in motion? Write the mathematical expression of a wave packet and explain how it represents the uncertainties found in the measurements in the quantum world. Give the principal involved.	**2**	**CO-2**
6.	A particle wave function is given as: $\psi = \text{Exp}[-i(5 \times 10^{-8})x)]$. Find its (i) momentum, (ii) energy, (iii) wavelength, (iv) probability of finding it in the volume element of a region $0<x<1$nm, $0<y<1.2$nm, $1<z<2$nm.	**4**	**CO-2**