Sanjay Ghodawat University, Kolhapur Established as State Private University under Govt. of Maharashtra. Act No XL, 2017		**2020-21** EXM/P/09/00
B.Sc. III,T.Y.B.Sc.	**School of Science**	**Department: Physics**
Course Code: PHS 302	**Course Name: Phy-VIII Quantum Physics**	**Semester :VI**
Day and Date: Thursday, 27.05.2021	**End Semester Examination**	**Time:2 Hrs. Max Marks:50**

Instructions: 1) All Questions are compulsory.

Q.1	**Answer / Solve the following(Any Two)**	**Marks**	**BL**	**CO**
a)	Explain in details, how Davission and Germer experiment proves de Broglie hypothesis.	8	L1	CO1
b)	Derive Schrodinger's time independent wave equation for the matter wave in 1-D.	8	L1	CO2
c)	Show that the probability current density $\vec{J} = \frac{i\hbar}{2m}[\psi\nabla\psi^* - \psi^*\nabla\psi]$, satisfy the equation of continuity and thereby explain the physical significance of equation of continuity.	8	L1	CO2
Q.2	**Answer / Solve the following(Any Two)**			
a)	With the help of steady state Schrodinger wave equation obtain the energy eigenvalues and normalized wave functions for motion of a particle along x-axis in infinite potential well.	8	L3	CO3
b)	i) Calculate the ground state energy of an electron confined to move freely between two ends separated by 2 Å. ii) Find the zero point energy in electron volts of a pendulum whose period is 1 s. (Given: h = 6.25 x 10^{-34} J.s)	8	L3	CO3
c)	Calculate the reflection and transmission coefficients of electrons through one-dimensional rectangular potential barriers.	8	L3	CO3
Q.3	**Answer / Solve the following(Any Two)**			
a)	Define an operator. Hence, obtain the expressions for	9	L2	CO4

	i) Linear momentum operator ii) Total energy operator iii) Parity operator			
b)	Derive expressions for the operators L_x, L_y, L_z and L^2 in spherical polar coordinates.	9	L2	CO4
c)	i) Derive the commutation relations for L_x, L_y and L_z. ii) Write a note on Ladder operator.	9	L2	CO4

*****