

## M.Sc. Sem.-3 Examination

501

Physics

Time : 2-30 Hours]

March-2025

[Max. Marks : 70

Q.No.	QUESTIONS	MARK
1(A)	Write the types of molecular excitations and explain in details on Molecular excitations of I from molecular band spectra.	07
1(B)	Write the names of nuclear properties and discuss electric quadrupole moment and show that existence of quadrupole moment in terms of $I \geq 1$ :	07
OR		
1(A)	Define the resonance and describe the molecular beam resonance method in detail with necessary diagram and explain experiment of $D_2$ .	07
1(B)	Derive the relation for the magnetic dipole moment $\mu_z$ of the nucleus. Prove that the magnetic dipole moment $\mu_z$ of a nucleus in a definite parity is non-zero.	07
2(A)	Give the names of potentials and explain in details on excited state of deuteron.	07
2(B)	Discuss p-p scattering at low energy and obtain scattering differential cross-section $\sigma_{sc}$ .	07
OR		
2(A)	Discuss the meson theory of nuclear force in detail.	07
2(B)	Assume ground state of deuteron; write Schrödinger equation in Centre of mass system. Derive the relation between depth potential and range of potential.	07
3(A)	Obtain Born condition in case of Yukawa potential for high energy scattering.	07
3(B)	Discuss Green function method to obtain formal solution of Schrödinger equation. Show that scattering amplitude is the Fourier transform of potential.	07
OR		
3(A)	Discuss Eikonal approximation and derive expression for scattering amplitude.	07
3(B)	Write and prove the Optical theorem.	07
4(A)	State the importance of transducer in equipment. Describe the Linear Variable Differential Transformer in detail.	07
4(B)	Explain the terms: [1] Signal conditioning and [2] Phase sensitive detection	07
OR		
4(A)	Define transducer. Give the concept of different temperature transducers. Explain resistance temperature detector transducer.	07
4(B)	Define Noise figure. Show that in multi stage cascaded amplifier, efforts should be made the noise due to the first stage.	07
5	Answer the Following in Brief: (ANY SEVEN)	14
1	Write the n-p capture reaction.	
2	Calculate the nuclear density of nucleus.	
3	Write the angular momentum states according to wave mechanics.	
4	A fine structure was discovered by _____ with resolving power interferometer.	
5	Ground state of deuteron is mixture of _____ and _____ states.	
6	Define Majorana and Bartlett exchange force.	
7	Write the orthogonality condition for Legendre Polynomial.	
8	What will be the scattering amplitude for S-electrons and unit of solid angle.	
9	If the wavelength increased by 10%, what will be the change in wave vector?	
10	Give the schematic of capacitor transducer as liquid level detector.	
11	Define Flicker noise.	
12	Define calibration of transducer and give one example.	