Enrollment No:	Exam Seat No:
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C. U. SHAH UNIVERSITY

Winter Examination - 2022

Subject Name: Nuclear and Particle Physics

Subject Code: 5SC03NPP1 Branch: M.Sc. (Physics)

Semester: 3 Date: 22/11/2022 Time: 11:00 To 02:00 Marks: 70

Instructions:

- (1) Use of Programmable calculator and any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

SECTION – I					
Q-1		Attempt the Following questions	(07)		
	a	List out the problems in beta decay.	01		
	b	Write any nuclear reaction showing the alpha decay.	01		
	c	Find radius of ⁵⁴ Ni nucleus.	01		
	d	Find radius of ³⁶ Cl nucleus using electron diffraction.	01		
	e	Write Geiger-Nuttall Law.	01		
	f	Show the nuclear reaction showing beta decay.	01		
	g	What do you mean by internal pair production in gamma decay.	01		
Q-2		Attempt all questions	(14)		
	a	Explain in detail Rutherford's alpha scattering experiment for the measurement of nuclear size in detail	07		
	b	Write a detail note on alpha spectrum and fine structure.	07		
		OR			
Q-2		Attempt all questions	(14)		
	a	Derive an equation for the disintegration energy of alpha decay.	06		
	b	Write a note on nuclear reactions in detail and give examples of each nuclear equation.	08		
Q-3		Attempt all questions	(14)		
	a	Explain Pauli's neutrino hypothesis.	07		
	b	Write a note on Gamma decay.	07		
		OR			
Q-3					
÷		Write a note on Fermi's theory of beta decay.	14		



SECTION - II

Q-4		Attempt the Following questions	(07)
		What is the difference between liquid drop and nucleus?	01
		List out the magic numbers.	01
		Find spin and parity of S^{31} .	01
		Mesons and Baryons made of how many quarks?	01
	e.	Find spin and parity of N^{13} .	01
		List out the members of Hadrons. Define CPT theorem.	01 01
	g.	Define CFT theorem.	VI
Q-5		Attempt all questions	(14)
	a	Write a note on Odd mass parabola in detail with necessary diagram.	07
	b	Write a note on quarks and explain in brief four fundamental forces of nature.	07
		OR	
Q-5		Attempt all questions	
	a	Classify the elementary particles and define Baryon numbers and lepton	07
		numbers.	0=
	b	Derive SEMF and obtain equation of Binding Energy.	07
Q-6		Attempt all questions	(14)
	a	Write a note on main assumptions of the single particle shell model.	06
	b	List out the evidence leads to the shell model	08
		OR	
Q-6		Check the nuclear reaction is allowed or not with detail description?	14
		1. $\Sigma^+ + \eta \rightarrow \Sigma^- + \rho$	14
		• _	
		2. $\pi^+ + n \rightarrow K^+ + \Sigma^0$	
		3. $\Lambda^0 \rightarrow \Sigma^+ + \pi^-$	
		4. $\Lambda^0 + n \rightarrow \Sigma^- + p$	
		5. $K^+ \rightarrow \pi^+ + \pi^0 + \pi^0$	
		6. $K^+ \to \pi^- + \pi^0$	
		7. $K^{-} + p \rightarrow K^{0} + n$	

