QP Code: R252G033 | Reg. No | | | | | | | | | | | AY 24

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)

M.Sc. (Second Semester - Regular) Examinations, July – 2025

24MPHPC12002 – Basic Nuclear and Particle Physics

(Physics**)**

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Discuss the graph between mass number and packing fraction (BE/A).	CO1	K2
b. Define Scattering length with a neat graph.	CO2	K2
c. Give two examples of spin - parity (J^p) under extreme single particle model.	CO3	K2
d. Discuss the test for isospin with examples.	CO4	K2
e. State the importance of color quantum number.	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain Bethe-Weizsacker binding energy formula.	5	CO1	K2
b. Find the expression for nuclear potential well depth of deuteron with graph.	5	CO2	K2
(OR)			
c. Mention nuclear size, radius and density of a nucleus.	5	CO1	K1
d. Discuss the theory of tensor forces in deuteron system.	5	CO2	K2
3.a. Discuss n-p scattering at low energy.	6	CO2	K2
b. Explain the meson theory of nuclear force	4	CO2	K1
(OR)			
c. What are various types of nuclear reactions.	5	CO3	K1
d. Derive Breit-Wigner dispersion formula for S-wave.	5	CO3	K2
4.a. Describe the role of spin-orbit interaction in the shell model with an example.	6	CO3	K2
b. Find out the magnetic moment of even N-odd Z nucleus	4	CO3	K2
(OR)			
c. State and prove Gell-Mann Nishijima Scheme and apply to hadrons.	6	CO4	K2
d. Mention the fundamental forces of nature.	4	CO4	K1
5.a. Define parity and the test for parity conservation with examples.	5	CO4	K2
b. What are leptons? Mention their quantum numbers.	5	CO4	K1
(OR)			
c. Define charge conjugation with examples.	6	CO5	K1
d. Write notes on Baryon Octet and Decuplet with necessary weight diagram.	4	CO5	K2
6.a. Discuss CPT Theorem. What are its consequences.	6	CO5	K2
b. Show that charge of a particle is equal to negative of its antiparticle	4	CO5	K2
(OR)			
c. Discuss quark model with their characteristics	6	CO5	K2
d. Discuss the classification of mesons with weight diagram.	4	CO5	K2

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