C.U.SHAH UNIVERSITY Summer Examination-2019

Subject Name : Nuclear Physics and ElectromagnetismSubject Code : 4SC05NPE1Branch: B.Sc. (Physics)Semester : 5Date : 22/03/2019Time : 10:30 To 01:30Marks : 70

Instructions:

- (1) Use of Programmable calculator & 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.

Q-1 Attempt the following questions:

- **a**) Using the concept of binding energy explain why iron is found in abundance on earth.
- **b**) What is the charge of a nucleus?
- c) Give the relation between radius of a nucleus (R) and its mass number (A).
- d) Define Parity.
- e) What do you mean by Quadrupole moment?
- f) In the liquid drop model; a drop of liquid is compared to ----- of an atom
- g) What are nuclear magic numbers?
- **h**) Give the expression for Faraday's law of induction.
- i) Give the expression for Poynting vector.
- **j**) Define skin depth.
- **k**) Define retarded time.
- I) If an electric field is moving along X-axis and magnetic field along Y-axis; then along which direction will the corresponding electromagnetic wave travel?
 - i) X-axis ii) Y-axis iii) Z-axis iv) Parallel to both E and B
- **m**) Name the force that is used to determine the pressure of electromagnetic radiations.
- n) Name the two potentials of an electromagnetic wave.

Attempt any four questions from Q-2 to Q-8

Q-2		Attempt all questions	
	a)	Define binding energy of a nucleus. How can it be derived from the expression of mass defect?	(09)
		Explain the binding energy per nucleon plot.	
	b)	Explain briefly the two coupling methods by which the total angular momentum (J) of a nucleus can be determined.	(03)
	c)	Explain briefly why lighter nuclei undergo fusion while heavier nuclei follow fission.	(02)
Q-3		Attempt all questions	(14)
	a)	Give the difference between BE and FD statistics.	(04)
	b)	Mention the properties of nuclear force.	(04)



(14)

	c)	Derive the formula for the magnetic moment of a nucleus.	(06)
Q-4		Attempt all questions	(14)
	a)	Explain the concept of mass parabola for odd nuclei taking the example of an isobaric family with A=91.	(05)
	b)	Explain the volume and surface energy term contributing to the semi empirical mass formula.	(05)
	c)	Mention at least four evidences that led to shell model	(04)
Q-5		Attempt all questions	(14)
	a)	Derive the Lorentz-Gauge condition.	(07)
	b)	Explain the concept of polarization.	(07)
Q-6		Attempt all questions	(14)
	a)	Prove that electromagnetic radiation has pressure and momentum.	(10)
	b)	Explain the concept of Retarded potentials and also specify the formulas for the same.	(04)
Q-7		Attempt all questions	(14)
	a)	Derive the formula for energy flux in a plane wave <n>.</n>	(12)
	b)	State Gauss's law.	(02)
Q-8		Attempt all questions	(14)
	a)	Derive the expressions for scalar (\emptyset) and vector potentials (A) in order to understand the concept of radiation from an oscillating dipole.	(07)
	b)	Explain the concept of a linear antenna.	(07)

