Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

FT3CO18 Nuclear Safety & Radio Active Materials

Programme: B.Tech. Branch/Specialisation: FT

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The atomic number is not changed by which type of radioactive decay: **1**
(a) Beta
(b) Gamma
(c) Alpha
(d) The atomic number is affected by all forms of radioactive decay

ii. Isotopes of an element have a different number of: **1**
(a) Proton (b) Neutron (c) Electron (d) Atom

iii. Three types of radioactive elements are emitted when unstable nuclei undergo radioactive decay. Which of the following is not one of them? **1**
(a) Beta (b) Gamma (c) Alpha (d) Delta

iv. Helium nuclei particles are called: **1**
(a) Gamma particles
(b) Beta particles
(c) Alpha particles
(d) No particles that are helium nuclei

v. Which statement is true for all three types of radioactive emission? **1**
(a) They are deflected by electric fields
(b) They ionise gases
(c) They are completely absorbed by a thin aluminium sheet
(d) They emit light

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vi. Isotopes of an element have nuclei with: **1**
(a) The same number of protons, but different numbers of neutrons.
(b) The same number of protons, and the same number of neutrons.
(c) A different number of protons, and a different number of neutrons.
(d) A different number of protons, and the same number of neutrons.

vii. An alpha particle is also known as: **1**
(a) An electron (b) A positron
(c) A helium nucleus (d) A photon

viii. The radiation emitted from the splits into: **1**
(a) Two components (b) Four components
(c) Five components (d) Three components

ix. The radiations emitted by different elements are: **1**
(a) Alpha (b) Beta (c) Gamma (d) All of these

x. The spontaneous emission of radiation by unstable nuclei is called: **1**
(a) Positive radioactivity (b) Artificial radioactivity
(c) natural radioactivity (d) Negative radioactivity

Q.2 i. What is radiation, explain in detail? **2**
ii. Explain nuclear energy with all reaction involved. **3**
iii. Elaborate biological effect of instant & long-time exposure. **5**
OR iv. Write short notes on any two: **5**
(a) Electromagnetic waves (b) Alpha rays
(c) Gamma rays (d) Beta rays
(e) Half life

Q.3 Attempt any two:
i. Explain the use of radiation placards and label requirements in transport, packaging and storage of radioactive material? **5**
ii. Explain pocket chamber dosimeter and its working principle used in radiation measure. **5**
iii. Discuss working and construction of GM counter. **5**

Q.4 i. What are the measures to be taken for protection in case of any radiation hazard? **4**
ii. Explain the different type of exposure. **6**
OR iii. Write short notes on any three: **6**
(a) ICRP (b) DWL
(c) Radiological control (d) Contamination
(d) Decontamination

Q.5 i. Differentiate between fission and fusion reaction? **4**
ii. Explain the case study of Chernobyl nuclear power plant accident. **6**
OR iii. Describe radioactive waste management and explain solid, liquid and gas radioactive waste management. What precaution should be taken for handling of radioisotope waste? **6**

Q.6 Attempt any two:
i. Explain duty and responsibility of a fire officer in radioactive radiation accident. **5**
ii. What are the safety objectives defined in nuclear power plant? Explain in detail. **5**
iii. Write short notes on any two: **5**
(a) ALARA (b) Heat detectors
(c) Radiation detectors (d) Smoke detectors
(d) Infrared detectors

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Marking Scheme

FT3CO18 Nuclear Safety & Radio Active Materials

Q.1	i.	The atomic number is not changed by which type of radioactive decay: (b) Gamma		**1**
	ii.	Isotopes of an element have a different number of: (b) Neutron		**1**
	iii.	Three types of radioactive elements are emitted when unstable nuclei undergo radioactive decay. Which of the following is not one of them? (d) Delta		**1**
	iv.	Helium nuclei particles are called: (c) Alpha particles		**1**
	v.	Which statement is true for all three types of radioactive emission? (b) They ionise gases		**1**
	vi.	Isotopes of an element have nuclei with: (a) The same number of protons, but different numbers of neutrons.		**1**
	vii.	An alpha particle is also known as: (c) A helium nucleus		**1**
	viii.	The radiation emitted from the splits into: (d) Three components		**1**
	ix.	The radiations emitted by different elements are: (d) All of these		**1**
	x.	The spontaneous emission of radiation by unstable nuclei is called: (c) natural radioactivity		**1**
Q.2	i.	Radiation		**2**
		1 mark for each type of radiation	(1 mark * 2)	
	ii.	Nuclear energy	1 mark	**3**
		Reaction	2 marks	
	iii.	Biological effect of instant exposure	2 marks	**5**
		Biological effect of long-time exposure	3 marks	
OR	iv.	Write short notes on any two: 2.5 marks for each	(2.5 marks * 2)	**5**
Q.3		Attempt any two:		
	i.	Use of radiation placards	3 marks	**5**
		Label requirements	2 marks	
	ii.	Pocket chamber dosimeter	2 marks	**5**
		Its working principle used in radiation measure	3 marks	
	iii.	Working of GM counter	3 marks	**5**
		Construction of GM counter	2 marks	
Q.4	i.	Measures to be taken for protection in case of any radiation hazard		**4**
		1 mark for each measure	(1 mark * 4)	
	ii.	Three type of exposure		**6**
		2 marks for each	(2 marks * 3)	
OR	iii.	Write short notes on any three:		**6**
		marks for each	(2 marks * 3)	
Q.5	i.	Fission reaction	2 marks	**4**
		Fusion reaction	2 marks	
	ii.	Chernobyl nuclear power plant accident.		**6**
		Detail study with all aspects		
OR	iii.	Radioactive waste management	2 marks	**6**
		Solid radioactive waste management	1 mark	
		Liquid radioactive waste management	1 mark	
		Gas radioactive waste management	1 mark	
		Precaution	1 mark	
Q.6		Attempt any two:		
	i.	Duty of a fire officer	3 marks	**5**
		Responsibility of a fire officer	2 marks	
	ii.	Nuclear power plant	2 marks	**5**
		Safety objectives 1 mark for each (1 mark * 3)	3 marks	
	iii.	Write short notes on any two: 2.5 marks for each	(2.5 marks * 2)	**5**

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