Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2019

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. Out of the following the one which has no charge is **1**
(a) Gamma rays (b) Beta rays
(c) Alpha rays (d) Cathode rays

ii. Fusion bomb involves. **1**
(a) Combination of lighter nuclei into bigger nucleus
(b) Destruction of heavy nucleus into smaller nuclei
(c) Combustion of oxygen
(d) Explosion of TNT

iii. A radioactive isotopes decays at such rate that after 192 minutes only 1/16 of the original amount remains. Its half life is..... **1**
(a) 32 min (b) 48 min (c) 12 min (d) 24 min

iv. Geiger Muller counter can detect **1**
(a) Beta rays (b) X-rays
(c) Gamma rays (d) All of these

v. The reduction in counting efficiency of the scintillation detector is called as _____ **1**
(a) Disintegration (b) Decay
(c) Quenching (d) Reduction

vi. One of the following is a device that detects charged particles but does NOT show their tracks. Is this device the: **1**
(a) Spark chamber (b) Photographic plate
(c) Scintillation counter (d) Bubble chamber

vii. The process by which a heavy nucleus is divided into two light nuclei is known as: **1**
(a) Splitting (b) Fission (c) Fusion (d) Disintegration

P.T.O.

viii. The first nuclear power plant in India is located at **1**
(a) Kota (b) Kalapakkam
(c) Tarapur (d) Baraeilly

ix. Gas cooled reactor uses following materials as moderator and coolant **1**
(a) Graphite, Co_2 (b) Graphite, Air
(c) Heavy water, Co_2 (d) Lead, H_2

x. The commonly used material for shielding is **1**
(a) Lead or concrete (b) Lead and tin
(c) Graphite or cadmium (d) Thick galvanised sheets

Q.2 i. List out radioactive materials. **2**
ii. What do you mean by "Electromagnetic Wave"? Explain. **3**
iii. Describe radioactivity phenomena and compare with alpha, beta and gamma rays. **5**
OR iv. Explain the different type of biological effects of radiation. **5**

Q.3 i. List two characteristics and two disadvantages of pocket dosimeter. **2**
ii. Discuss the construction and working of Geiger-Muller (GM) counter. **8**
OR iii. What type of energy release in the radioactive materials? Discuss its type. **8**

Q.4 i. List any three precautions taken in each case of external and internal radiation hazards **3**
ii. Describe the working principle of various instruments used for measurement of radiation. **7**
OR iii. What are the current guidelines of ICRP for radiation protection? **7**

Q.5 i. Write a short note on genetic hazards of radiation. **4**
ii. Explain any case study of nuclear power plant accident. Also discuss the precautionary steps taken. **6**
OR iii. Describe the component of nuclear power station. **6**

Q.6 Attempt any two:
i. Discuss on safety measure of nuclear reactor and control measures of radiation in emergencies **5**
ii. Describe the importance of fire detection and alarming system. **5**
iii. What is ALARA? Writes its principles for reducing radiation exposure. **5**

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Marking Scheme

FT3CO18 Nuclear Safety & Radio Active Materials

Q.1	i.	Out of the following the one which has no charge is (a) Gamma rays	**1**
	ii.	Fusion bomb involves. (a) Combination of lighter nuclei into bigger nucleus	**1**
	iii.	A radioactive isotopes decays at such rate that after 192 minutes only 1/16 of the original amount remains. Its half life is..... (b) 48 min	**1**
	iv.	Geiger Muller counter can detect (d) All of these	**1**
	v.	The reduction in counting efficiency of the scintillation detector is called as _____ (c) Quenching	**1**
	vi.	One of the following is a device that detects charged particles but does NOT show their tracks. Is this device the: (c) Scintillation counter	**1**
	vii.	The process by which a heavy nucleus is divided into two light nuclei is known as: (b) Fission	**1**
	viii.	The first nuclear power plant in India is located at (c) Tarapur	**1**
	ix.	Gas cooled reactor uses following materials as moderator and coolant (a) Graphite, Co_2	**1**
	x.	The commonly used material for shielding is (a) Lead or concrete	**1**
Q.2	i.	List out radioactive materials. Any three with explanation	**2**
	ii.	Electromagnetic Wave	**3**
		Explanation 2 marks	
		Diagram 1 mark	
	iii.	Radioactivity phenomena 2 marks	**5**
		Compare with alpha, beta and gamma rays. 3 marks	
OR	iv.	Biological effects of radiation	**5**
		Definition 1 mark	
		Effect of radiation 2 marks	
		Somatic and Genetic effects 2 marks	
Q.3	i.	Two characteristics and two disadvantages of pocket dosimeter.	**2**
	ii.	Geiger-Muller (GM) counter.	**8**
		Diagram 4 marks	
		Working 4 marks	
OR	iii.	Name of energy 1 mark	**8**
		Types 2 marks	
		Explanation of materials 5 marks	
Q.4	i.	Any three precautions of external radiation hazards 1.5 marks	**3**
		Any three precautions of internal radiation hazards 1.5 marks	
	ii.	Name of instruments at least five 2 marks	**7**
		Explanation 5 marks	
OR	iii.	Guidelines of ICRP for radiation protection	**7**
		1 mark for each point (1 mark * 7)	
Q.5	i.	Any four Genetic hazards of radiation	**4**
	ii.	Any case study of nuclear power plant accident 4 marks	**6**
		Precautionary steps taken. 2 marks	
OR	iii.	Component of nuclear power station. 2 marks	**6**
		Diagram 2 marks	
		Explanation of each component 2 marks	
Q.6		Attempt any two:	
	i.	Safety measure of nuclear reactor 2.5 marks	**5**
		Control measures of radiation in emergencies 2.5 marks	
	ii.	Importance of fire detection system. 2.5 marks	**5**
		Importance of alarming system 2.5 marks	
	iii.	ALARA 3 marks	**5**
		Principles for reducing radiation exposure 2 marks	

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