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

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

FT3CO19 Hazard Identification & Risk Assessment

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. Which of the following data is not required for hazard identification? **1**

(a) Land use (b) Contaminant levels

(c) Affected population (d) Estimation of risk.

ii What is the main objective of risk assessment? **1**

(a) To evaluate hazard and minimize the risks

(b) Remediation of contaminated sites

(c) Hazard management

(d) To know source of pollutants

iii MTTF stands for- **1**

(a) Minimum time to failure (b) Mean time to failure

(c) Maximum time to failure (d) None of these

iv Suppose that a certain software product has a mean time between failures of 10,000 hrs and has a mean time to repair of 20 hrs. If the product is used by 100 customers, what is its availability? **1**

(a) 80% (b) 90% (c) 98% (d) 99.8%

v When to use FMEA? **1**

(a) Concept generation or selection

(b) Preliminary design

(c) Design improvement programs

(d) All of these

vi The manner in which a system, subsystem, or component could potentially fail to meet the design requirements is- **1**

(a) Failure mode (b) Cause

(c) Effect (d) All of these

P.T.O.

vii		Which of these are not a chemical from a regulatory point of view? (a) Gasoline (b) Milk (c) A new flammable liquid storage can (d) Benzene	**1**
viii		A BLEVE results from the rupture of a vessel containing a liquid substantially above its _____. (a) Melting point (b) Critical point (thermodynamics) (c) Boiling point (d) Phase transition	**1**
ix		What is the first stage of risk assessment? (a) Exposure assessment (b) Hazard identification (c) Toxicity study (d) Risk characterisation	**1**
x		Hazard identification mainly focus on- (a) Chemical source & concentration (b) Chemical exposure (c) Chemical analysis (d) Chemical pathway	**1**
Q.2	i.	Discuss the significance of guide words in HAZOP.	**2**
	ii.	Define hazard and risk. Give one example each.	**3**
	iii.	Differentiate between 'What if' analysis and HAZOP with the help of an example.	**5**
OR	iv.	List out Dow fire and explosion index penalties for special process hazards and explain any five in detail.	**5**
Q.3	i.	Define reliability function and failure rate.	**3**
	ii.	Suggest methods for improving plant availability. Explain a bathtub curve.	**7**
OR	iii.	Differentiate between MTBF and MTTF.	**7**
Q.4	i.	Discuss the various symbols and its meanings used in ETA.	**3**
	ii.	Explain the concept “minimal cut set" and its significance in fault tree evaluation.	**7**
OR	iii.	What are the objectives of FMEA? How is it carried out? Explain with the help of an example.	**7**

Q.5	i.	Discuss the cause and consequence of BLEVE.	**4**
	ii.	Briefly discuss the salient features of discharge rate models used for consequence modelling.	**6**
OR	iii.	Discuss the features of the following: (a) Pool fire (b) Jet fire (c) Flash fire	**6**
Q.6		Attempt any two:	
	i.	Differentiate between individual risk and societal risk.	**5**
	ii.	How is F-N Curve used in the quantification of societal risk.	**5**
	iii.	What are the issues in developing an acceptable level of risk? What is ALARP?	**5**

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Marking Scheme
FT3CO19 Hazard Identification & Risk Assessment

Q.1	i.	Which of the following data is not required for hazard identification? (d) Estimation of risk.		**1**
	ii	What is the main objective of risk assessment? (a) To evaluate hazard and minimize the risks		**1**
	iii	MTTF stands for- (b) Mean time to failure		**1**
	iv	Suppose that a certain software product has a mean time between failures of 10,000 hrs and has a mean time to repair of 20 hrs. If the product is used by 100 customers, what is its availability? (d) 99.8%		**1**
	v	When to use FMEA? (d) All of these		**1**
	vi	The manner in which a system, subsystem, or component could potentially fail to meet the design requirements is- (a) Failure mode		**1**
	vii	Which of these are not a chemical from a regulatory point of view? (b) Milk		**1**
	viii	A BLEVE results from the rupture of a vessel containing a liquid substantially above its _____. (b) Critical point (thermodynamics)		**1**
	ix	What is the first stage of risk assessment? (b) Hazard identification		**1**
	x	Hazard identification mainly focus on- (a) Chemical source & concentration		**1**
Q.2	i.	Significance of guide words in HAZOP.		**2**
	ii.	Definition of hazard and risk Example each	2 marks 1 mark	**3**
	iii.	Differentiate between 'What if' analysis and HAZOP Five differences 1 mark for each	(1 mark * 5)	**5**
OR	iv.	List out Dow fire List out explosion index penalties	3 marks 2 marks	**5**
Q.3	i.	Definition of reliability function Failure rate	1.5 marks 1.5 marks	**3**
	ii.	Methods for improving plant availability A bathtub curve	4 marks 3 marks	**7**
OR	iii.	Differentiate between MTBF and MTTF 1 mark for each difference		**7**
Q.4	i.	Symbols in ETA Its meanings used in ETA	2 marks 1 mark	**3**
	ii.	Minimal cut set Its significance in fault tree evaluation	4 marks 3 marks	**7**
OR	iii.	Objectives of FMEA it is carried out Example	3 marks 2 marks 2 marks	**7**
Q.5	i.	Cause of BLEVE Consequence of BLEVE	2 marks 2 marks	**4**
	ii.	Features of discharge rate models Consequence modelling with proper chart	4 marks 2 marks	**6**
OR	iii.	Discuss the features of the following: (a) Pool fire (b) Jet fire (c) Flash fire	 2 marks 2 marks 2 marks	**6**
Q.6		Attempt any two:		
	i.	Differentiate between individual risk and societal risk. 1 mark for each	 (1 mark * 5)	**5**
	ii.	F-N Curve used in the quantification of societal risk As per explanation		**5**
	iii.	Issues in developing an acceptable level of risk ALARP	3 marks 2 marks	**5**

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