

Enrolment No.....



Faculty of Engineering
End Sem Examination May-2024

FT3CO45 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. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. Before performing a Process Hazard Analysis, such as a HAZOP, the 1
participants in the study will need to have all of the following safety
information, except:
(a) A block flow diagram or simplified process flow diagram
(b) SIS internal wiring diagrams
(c) Area electrical classification
(d) Design codes and standards employed
- ii. Which of the following statements about the documentation required for 1
functional safety planning are true:
I. Safety planning documentation can be included as a section in the
quality plan entitled “safety plan”
II. Safety Planning can be documented in a series of documents that
may include other company procedures or working practices, such
as corporate standards
III. Safety planning must be documented in a separate document
entitled “safety plan”
(a) I and II are true, III is false (b) I and III are true, II is false
(c) I is true, II and III are false (d) I, II, and III are true
- iii. In Boolean algebra, the OR operation is performed by which properties? 1
(a) Associative properties (b) Commutative properties
(c) Distributive properties (d) All of these
- iv. The expression for Absorption law is given by _____. 1
(a) $A + AB = A$ (b) $A + AB = B$
(c) $AB + AA' = A$ (d) $A + B = B + A$

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- v. Types of FMEA are- **1**
 (a) AFMEA & BFMEA (b) DFMEA & PFMEA
 (c) CFMEA & DFMEA (d) PFMEA & QFMEA
- vi. What is FMEA? **1**
 (a) Fast Moving Engineered Automotive
 (b) Foreign Made Electrical Article
 (c) Failure Mode and Effect Analysis
 (d) Firozabad Municipal Electric Association
- vii. The result of a liquid within a container reaching a temperature well above its boiling point at atmospheric temperature, causing the vessel to rupture into two or more pieces is: **1**
 (a) BLEVE (b) Explosions
 (c) Fireball (d) Confined explosions
- viii. A turbulent diffusion fire burning above a horizontal pool of vaporising hydrocarbon fuel where the fuel has zero or low initial momentum is: **1**
 (a) Pool fire (b) Jet fires
 (c) Deep seated fire (d) None of these
- ix. The _____ process determines whether exposure to a chemical can increase the incidence of adverse health effect. **1**
 (a) Hazard identification (b) Exposure assessment
 (c) Toxicity assessment (d) Risk characterization
- x. 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
- Q.2 Attempt any two: **5**
 i. What is explosion? Also explain its type. **5**
 ii. Explain HAZOP in detail with producer and guide words. **5**
 iii. Write short note on: **5**
 (a) Dow fire (b) Explosion hazard index
 (c) Mond index (d) Unit hazard rating
 (e) Inventory analysis
- Q.3 Attempt any two: **5**
 i. What do you mean by process reliability? **5**
 ii. Differentiate between the MTBF and MTTF. **5**
 iii. Write short note on: **5**
 (a) Failure rate (b) Bathtub curve
 (c) Probability relationships (d) Simple reliability estimation

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- (e) Logic tree approach
- Q.4 Attempt any two: **5**
 i. Explain fault tree analysis with logic symbols and gates. **5**
 ii. Explain ETA with its process, advantages and disadvantages of ETA. **5**
 iii. Explain FMEA with its flow chart and also explain its methodology. **5**
- Q.5 Attempt any two: **5**
 i. Elaborate source models with its type. **5**
 ii. Elaborate dispersion models for a gas release with mathematical induction. **5**
 iii. Write short note on: **5**
 (a) Vapour cloud explosions (b) Flash fires
 (c) Physical explosions (d) BLEVE
 (e) Confined explosions
- Q.6 Attempt any two: **5**
 i. Differentiate between the quantitative and qualitative risk. **5**
 ii. Elaborate vulnerability analysis and also explain how you will do vulnerability analysis. **5**
 iii. Write short note on: **5**
 (a) ALARP (b) Risk contour
 (c) F-N curve (d) Societal risk
 (e) Risk indices

Marking Scheme

Hazard Identification & Risk Assessment (T)

FT3CO45 (T)

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|-----|-------|---|----------|
| Q.1 | i) | Before performing a Process Hazard Analysis, such as a HAZOP, the participants in the study will need to have all of the following safety information, except:
B) SIS internal wiring diagrams | 1 |
| | ii) | Which of the following statements about the documentation required for functional safety planning are true:
1. Safety planning documentation can be included as a section in the quality plan entitled “safety plan”
2. Safety Planning can be documented in a series of documents that may include other company procedures or working practices, such as corporate standards
3. Safety planning must be documented in a separate document entitled “safety plan”.
A) 1 and 2 are true, 3 is false | 1 |
| | iii) | In Boolean algebra, the OR operation is performed by which properties?
B) All of the Mentioned | 1 |
| | iv) | The expression for Absorption law is given by _____
A) $A + AB = A$ | 1 |
| | v) | Types of FMEA?
B) DFMEA & PFMEA | 1 |
| | vi) | What is FMEA?
C) Failure mode and effect analysis. | 1 |
| | vii) | The result of a liquid within a container reaching a temperature well above its boiling point at atmospheric temperature, causing the vessel to rupture into two or more pieces is:
A) BLEVE | 1 |
| | viii) | A turbulent diffusion fire burning above a horizontal pool of vaporising hydrocarbon fuel where the fuel has zero or low initial momentum is:
A) Pool fire | 1 |
| | ix) | The _____ process determines whether exposure to a chemical can increase the incidence of adverse health effect.
A) Hazard identification | 1 |
| | x) | Which of the following data is not required for hazard identification?
D) Estimation of risk | 1 |

- | | | | | |
|-----|------|---|---|----------|
| Q.2 | i. | What is explosion and also explain its type?
Explosion
Type | 3 Marks
2 Marks | 5 |
| | ii. | Explain HAZOP in detail with producer and guide words?
HAZOP
Producer
Guide words | 3 Marks
1 Marks
1 Marks | 5 |
| OR | iii. | Write short note on: (1 Mark for each)
a. Dow Fire
b. Explosion Hazard Index
c. Mond Index
d. Unit hazard rating
e. Inventory analysis | | 5 |
| Q.3 | i. | What do you mean by process reliability? | | 5 |
| | ii. | Differentiate between the MTBF and MTTF?
MTBF
MTTF | 3 Marks
2 Marks | 5 |
| OR | iii. | Write short note on: (1 Mark for each)
a. Failure rate
b. Bathtub curve
c. Probability relationships
d. Simple reliability estimation
e. Logic tree approach | 1 Marks
1 Marks
1 Marks
1 Marks
1 Marks | 5 |
| Q.4 | i. | Explain Fault tree analysis with logic symbols and gates?
Fault tree analysis with logic symbols
Gates | 3 Marks
2 Marks | 5 |
| | ii. | Explain ETA with its process, advantages and disadvantages of ETA?
ETA with its process
Advantages and disadvantages of ETA . | 2 Marks
3 Marks | 5 |
| OR | iii. | Explain FMEA with its flow chart and also explain its methodology?
FMEA with its flow chart (2.5 Marks)
Methodology (2.5 Marks) | | 5 |

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- Q.5 i. Elaborate Source models with its type? **5**
Source models (2.5 Marks)
Type (2.5 Marks)
- ii. Elaborate dispersion models for a gas release with mathematical induction? **5**
Dispersion models (2.5 Marks)
Mathematical induction (2.5 Marks)
- OR iii. Write short note on: (1 Mark for each) **5**
a. Vapour cloud explosions
b. Flash fires
c. Physical explosions
d. BLEVE
e. Confined explosions
- Q.6 i. Differentiate between the Quantitative and Qualitative risk? 5 **5**
points
- ii. Elaborate vulnerability analysis and also explain how you will do vulnerability analysis? **5**
- OR iii. Write short note on: (1 Mark for each) **5**
a. ALARP 1 Marks
b. Risk contour 1 Marks
c. F-N curve 1 Marks
d. Societal risk 1 Marks
e. Risk indices 1 Marks
