SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

II SEMESTER

IS3262 - SYSTEM SIMULATION AND HAZARD ANALYSIS

Regulation – 2023

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QUESTION BANK

SUBJECT/SUBJECT CODE : SYSTEM SIMULATION AND HAZARD ANALYSIS /IS3262
SEM/YEAR :II SEM/I YEAR

UNIT I: HAZARD, RISK ISSUES AND HAZARD ASSESSMENT

Introduction, hazard, hazard monitoring-risk issue, group or societal risk, individual risk, voluntary and involuntary risk, social benefits Vs technological risk, approaches for establishing risk acceptance levels, Risk estimation. Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, preliminary hazard analysis (PHA), human error analysis, hazard operability studies(HAZOP),safety warning systems.

PART - A (2Marks)

S.No	QUESTIONS	LEVEL	COMPETENCE
1.	Define hazard.	BT1	Remember
2.	Define risk estimation.	BT1	Remember
3.	Prepare a check list analysis.	BT4	Analyze
4.	Identify the steps involved in preliminary hazard analysis.	BT1	Remember
5.	Compare voluntary and involuntary risk.	BT2	Evaluate
6.	Point out safety warnings systems considered in manufacturing industries.	BT2	Analyze
7.	Distinguish between risk assessment and risk control.	BT2	Understand
8.	List out the purpose of human error assessment.	BT1	Remember
9.	Formulate hazard monitoring.	BT4	Analyze
10.	Define group risk.	BT1	Remember
11.	Examine individual risk.	BT3	Apply
12.	Assess technological risk.	BT5	Evaluate
13.	How do you correlate social benefits with technological risk?	BT4	Analyze
14.	Define risk acceptance level.	BT1	Remember
15.	How do you assess a hazard?	BT5	Evaluate

16.	What do you understand by the term safety audit?	BT2	Understand
17.	Formulate what if analysis.	BT2	Understand
18.	Evaluate safety review.	BT2	Understand
19.	Discuss the term Hazop.	BT2	Understand
20.	What is meant by checklist analysis?	BT1	Remember
21.	What is the goal of risk assessment?	BT2	Understand
22.	Why is risk assessment important?	BT2	Understand
23.	How do you plan for a risk assessment?	BT2	Understand
24.	How is a risk assessment done?	BT1	Remember
25.	How are the hazards identified?	BT2	Understand

PART - B (16 Marks)				
S.No	**QUESTIONS**	**Marks**	**Level**	**Competence**
1	Discuss in detail about human error analysis.	16	BT3	Apply
2	Explain how hard identification, risk assessment and control procedures are followed in industries with suitable examples.	16	BT4	Analyze
3	Describe the various risk encountered during hazard monitoring. What are the approaches for accepting risk levels? Explain.	16	BT2	Understand
4	Discuss the procedure and methodology followed in risk assessment.	16	BT2	Understand
5	How is HAZOP conducted? Explain in detail with a case study.	16	BT4	Analyze
6	Explain in detail about hazard monitoring.	16	BT4	Analyze
7	Compare about the social benefits Vs technological risks from industrial development.	16	BT4	Analyze
8	How safety audit is conducted in a hazardous industry? Explain it.	16	BT4	Analyze
9	Explain in detail about Preliminary Hazard Analysis.	16	BT4	Analyze
10	Discuss steps involved in risk estimation.	16	BT4	Analyze
11	Explain human error analysis.	16	BT4	Analyze
12	Formulate the procedure necessary for the safety review in an industry.	16	BT4	Analyze
13	Explain the factors for consideration of safety warning systems.	16	BT4	Analyze
14	Describe in detail about risk issue.	16	BT4	Analyze
15	Explain the approaches for establishing acceptance level.	16	BT4	Analyze

16	Explain the various steps involved in performing a "what if analysis" for an industrial set up.	16	BT4	Analyze
17	Show the accounts of in audit systems in fire control and industrial Hygiene department.	16	BT4	Analyze

UNIT II : COMPUTER AIDED INSTRUMENTS

Applications of Advanced Equipments and Instruments, Thermo Calorimetry, Differential Scanning Calorimeter(DSC), Thermo Gravimetric Analyser(TGA), Accelerated Rate Calorimeter(ARC), Reactive Calorimeter(RC), Reaction System Screening Tool(RSST) - Principles of operations, Controlling parameters, Applications, advantages. Explosive Testing, Deflagration Test, Detonation Test, Ignition Test, Minimum ignition energy Test, Sensitiveness Test, Impact Sensitiveness Test(BAM) and Friction Sensitiveness Test (BAM), Shock Sensitiveness Test, Card Gap Test.

PART - A (2Marks)

S.No	QUESTIONS	LEVEL	COMPETENCE
1.	Describe minimum ignition energy test.	BT2	Understand
2.	Analyze the merits of Advanced Reactive System Screening Tool.	BT4	Analyze
3.	Assess the significance of impact sensitiveness test.	BT5	Evaluate
4.	Formulate the applications of advanced equipment.	BT4	Analyze
5.	List the advantages of RSST.	BT1	Remember
6.	Analyze the parameters to be measured in deflagration test.	BT4	Analyze
7.	How will you interpret the enthalpy of the given substance using Thermo Calorimetry test?	BT2	Understand
8.	What is Minimum Ignition Energy?	BT1	Remember
9.	Formulate the applications of thermo calorimetry.	BT4	Analyze
10.	Define card gap test.	BT1	Remember
11.	Summarize the advantages of DSC.	BT5	Evaluate
12.	Draw and label a neat figure of the impact sensitivity testing machine.	BT1	Remember
13.	Describe the purpose of ignition test.	BT2	Understand
14.	List the application of explosive test	BT1	Remember
15.	Analyze the advantages of Deflagration Test	BT4	Analyze
16.	State the applications of detonation test	BT1	Remember
17.	What is the purpose of Sensitiveness Test?	BT1	Remember
18.	Formulate the applications of Shock Sensitiveness Test	BT4	Analyze
19.	What do you understand by the term Friction Sensitiveness Test	BT2	Understand
20.	Narrate the applications of Shock Sensitiveness Test	BT1	Remember
21.	What is meant by minimum ignition energy test?	BT1	Remember
22.	Tell about the merits of Advanced Reactive System Screening Tool.	BT1	Remember
23.	What is the significance of impact sensitiveness test?	BT4	Analyze

24.	List out the parameters to be measured in deflagration test.	BT2	Understand
25.	State the application of thermos calorimeter	BT1	Remember

PART - B (16 Marks)				
S.No	**QUESTIONS**	**Marks**	**Level**	**Competence**
1	Prepare in detail about the various advanced computer aided instruments With suitable example.	16	BT5	Analyze
2	Discuss the various types of testing applied in hazard analysis	16	BT2	Understand
3	Explain the significance of TGA. Mention its applications, advantages and disadvantages.	16	BT4	Analyze
4	With a neat diagram, explain the construction and working of a BAM friction tester.	16	BT4	Analyze
5	Utilizing DSC, how will you find the various physical properties and explain it clearly.	16	BT1	Remember
6	Explain Accelerated Rate Calorimeter(ARC).	16	BT4	Analyze
7	Elaborate the construction of differential scanning calorimeter.	16	BT2	Understand
8	Distinguish impact and friction testing methods.	16	BT4	Analyze
9	Explain the working of thermo gravimetric analyser.	16	BT2	Understand
10	Write short notes on Safety Testing of explosive.	16	BT4	Analyze
11	What is Thermo Gravimetric Analyser (TGA)? Narrate the working principle of TGA, draw a typical TGA curve and interpret it in detail.	16	BT4	Analyze
12	What are the needs of explosive testing? Explain various explosive tests.	16	BT4	Analyze
13	With a neat sketch explain the functions of Differential Scanning Calorimetry and different calibration process involved in it.	16	BT4	Analyze
14	Elaborate the construction and working of Thermo Gravimetric Analyser (TGA).	16	BT2	Understand
15.	Explain the influences of experimental conditions on TG curves.	16	BT4	Analyze
16.	Explain in detail about Reaction System Screening Tool(RSST)	16	BT4	Analyze
17.	Describe Friction Sensitiveness Test (BAM), Shock Sensitiveness Test	16	BT2	Understand

UNIT III : RISK ANALYSIS QUANTIFICATION AND SOFTWARES

Introduction to Discrete and Continuous Systems Simulation- Fault Tree Analysis and Event Tree Analysis, Logic symbols, methodology, minimal cut set ranking - fire explosion and toxicity index(FETI), various indices - Hazard analysis(HAZAN)- Failure Mode and Effect Analysis(FMEA)- Basic concepts of Reliability-Software on Risk analysis, CISCON, FETI, HAMGARS modules on Heat radiation, Pool fire, Jet, Explosion. Reliability softwares on FMEA for mechanical and electrical systems.

PART - A (2Marks)

S.No	QUESTIONS	LEVEL	COMPETENCE
1.	Compare FTA versus ETA.	BT2	Understand
2.	Define HAZAN.	BT1	Remember
3.	Assess fault tree analysis.	BT5	Evaluate
4.	Formulate Event Tree Analysis.	BT4	Analyze
5.	In what way FMEA is useful to improve a system design?	BT2	Understand
6.	What are the reliability software available for mechanical and electrical systems?	BT1	Remember
7.	List the main phases of FMEA	BT1	Remember
8.	What do you understand about logic symbols?	BT2	Understand
9.	Formulate toxicity index.	BT4	Analyze
10.	State minimal cut set ranking.	BT1	Remember
11.	Recommend the precautions to be taken to avoid fire explosion.	BT5	Evaluate
12.	Analyze the various indices.	BT4	Analyze
13.	Describe the term reliability.	BT2	Understand
14.	What is meant by pool fire?	BT1	Remember
15.	Analyze FMEA.	BT4	Analyze
16.	Write the advantages of HAZAN.	BT1	Remember
17.	Brief about CISCON.	BT1	Remember
18.	Formulate FETI.	BT4	Analyze
19.	Assess HAMGARS.	BT5	Evaluate
20.	Mention the software available on risk analysis.	BT1	Remember
21.	Define Risk Priority Number.	BT1	Remember
22.	What is meant by pool fire?	BT4	Analyze

23.	In what way FMEA is useful to improve s system design?	BT5	Evaluate
24.	What are the reliability software available for mechanical and electrical system?	BT1	Remember
25.	Name the main phases of FMEQ.	BT1	Remember

PART - B (16 Marks)				
S.No	**QUESTIONS**	**Marks**	**Level**	**Competence**
1	Explain the risk analysis procedure of Minimal cut set ranking.	16	BT4	Analyze
2	Explain the risk analysis procedure of FETI.	16	BT4	Analyze
3	Explain in detail about various indices.	16	BT4	Analyze
4	Explain in detail the steps involved in performing FETI.	16	BT4	Analyze
5	What is meant by FMEA? Explain its types. Also explain in detail the steps involved in performing it.	16	BT4	Analyze
6	List the various steps involved in FETI and apply FETI for an industrial setup handling dangerous chemicals and discuss it.	16	BT4	Analyze
7	Differentiate fault tree and event tree analysis.	16	BT1	Remember
8	Write short notes on HAZAN.	16	BT4	Analyze
9	Describe Fire Explosion for crude oil.	16	BT2	Apply
10	Mention few merits of reliability software on FMEA.	16	BT4	Analyze
11	What is fault tree analysis? Explain the logic symbols used in fault tree.	16	BT4	Analyze
12	Describe Toxicity Index(FETI)	16	BT4	Analyze
13	Explain the steps involved in HAZAN.	16	BT2	Apply
14	Discuss CISCON module on heat radiation.	16	BT4	Analyze
15.	Explain FETI module on heat radiation.	16	BT4	Analyze
16.	Explain HAMGARS module on heat radiation.	16	BT4	Analyze
17.	Describe “FMEA” in detail.	16	BT2	Apply

UNIT IV : CONSEQUENCES ANALYSIS

Logics of consequences analysis- Estimation- Hazard identification based on the properties of chemicals- Chemical inventory analysis- identification of hazardous processes- Estimation of source term, Gas or vapour release, liquid release, two phase release- Heat radiation effects, BLEVE, Pool fires and Jet fire- Gas/vapour dispersion- Explosion, UVCE and Flash fire, Explosion effects and confined explosion- Toxic effects- Plotting the damage distances on plot plant/layout.

PART – A

S.No	QUESTION	LEVEL	COMPETENCE
1.	Summarize the importance in logics of consequences analysis.	BT2	Understand
2.	Analyze flash fire and jet fire.	BT4	Analyze
3.	Assess consequence analysis.	BT5	Evaluate
4.	Write short note on hazard identification.	BT1	Remember
5.	Write any two various source terms.	BT1	Remember
6.	Analyze UVCE.	BT4	Analyze
7.	List few examples for Chemical toxicants.	BT1	Remember
8.	State the significance of plant layout.	BT1	Remember
9.	Define confined explosion.	BT1	Remember
10.	Compare UVCE and flash fire.	BT4	Analyze
11.	Differentiate between the pool fire and jet fire.	BT2	Understand
12.	Narrate heat radiation effects.	BT1	Remember
13.	What do you understand by the term BLEVE?	BT2	Understand
14.	Define pool fire.	BT1	Remember
15.	List the properties of chemicals.	BT1	Remember
16.	State the advantages of chemical inventory analysis.	BT1	Remember
17.	Write short notes on gas dispersion.	BT1	Remember
18.	Discuss the explosion effects.	BT2	Understand
19.	How do you estimate source term?	BT5	Evaluate
20.	What is meant by two phase release?	BT1	Remember
21.	Give few example for chemical toxicants.	BT1	Remember
22.	State the significance of plant layout.	BT1	Remember
23.	Define confined explosion.	BT2	Understand
24.	State the importance in logics of consequences analysis.	BT5	Evaluate
25.	Compare UVCE and Flash fire.	BT1	Remember

	PART - B (16 Marks)			
S.No	**QUESTIONS**	**Marks**	**Level**	**Competence**
1	How will you identify the hazard, based on the properties of chemicals?	16	BT1	Remember
2	Describe the consequence analysis of Gas/Vapour dispersion.	16	BT2	Understand
3	Describe the consequence analysis of UVCE.	16	BT4	Analyze
4	Explain in detail about hazard identification based on the properties of the chemicals. Also explain about the chemical inventory analysis.	16	BT4	Analyze
5	Formulate a consequence analysis of BLEVE, pool fire and jet fire.	16	BT4	Analyze
6	Explain in detail about BLEVE, Pool Fire, Jet fire and flash fire with reference to industrial establishments.	16	BT4	Analyze
7	Compare and contrast the various gas/vapour dispersion scenarios with examples.	16	BT4	Analyze
8	Explain the procedure for hazard identification based on properties of chemicals.	16	BT4	Analyze
9	Explain UVCE and flash fire with example.	16	BT4	Analyze
10	Explain in details the need for good plant layout.	16	BT4	Analyze
11	Discuss in detail about the steps involved in the consequence analysis.	16	BT4	Analyze
12	Explain the types of chemicals and legislations on hazardous substances in industries.	16	BT4	Analyze
13	What are the toxic effects of chemicals in industries? Analyze a material safety data sheet for diesel and chlorine.	16	BT2	Understand
14	Discuss in detail about explosion effects and confined explosion.	16	BT4	Analyze
15	Describe the consequence analysis of Toxic effects.	16	BT4	Analyze
16	Describe the consequence analysis of Explosion effects and confined explosion.	16	BT4	Analyze
17	Explain chemical inventory analysis.	16	BT4	Analyze

UNIT V : CREDIBILITY OF RISK ASSESSMENT TECHNIQUES

Past accident analysis as information sources for Hazard analysis and consequences analysis of chemical accident, Mexico disaster, Flixborough, Bhopal, Seveso, Pasadena, Feyzin disaster(1966), Port Hudson disaster- convey report, hazard assessment of non-nuclear installation- Rijnmond report, risk analysis of size potentially Hazardous Industrial objects- Rasmussen masses report, Reactor safety study of Nuclear power plant.

PART - A (2Marks)

S.No	QUESTIONS	LEVEL	COMPETENCE
1.	List the outputs derived from the reactor safety study of nuclear plant	BT1	Remember
2.	Write a note on Bhopal gas tragedy.	BT1	Remember
3.	What is risk assessment?	BT1	Remember
4.	Identify few major industrial disasters which have made an international	BT2	Understand
5.	Summarize the various possible nuclear accident scenarios.	BT2	Understand
6.	Summarize the merits of past accident analysis.	BT2	Understand
7.	Evaluate the lesson learnt from feyzin disaster.	BT5	Evaluate
8.	Describe the reason for Port Hudson disaster.	BT2	Understand
9.	Describe the significance of Rasmussen report.	BT2	Understand
10.	Define process hazard analysis.	BT1	Remember
11.	Identify the countermeasures against the freezing of valves.	BT1	Remember
12.	What do you understand from the Mexico disaster?	BT2	Understand
13.	Define convey report.	BT1	Remember
14.	What is meant by Pasadena?	BT1	Remember
15.	Analyze any two past accident analysis.	BT4	Analyze
16.	List out chemical accidents.	BT1	Remember
17.	List out the impact of Bhopal accident incident.	BT1	Remember
18.	What is meant by Rijnmond report?	BT1	Remember
19.	Assess safety precautions to be adopted in nuclear power plant.	BT5	Evaluate
20.	Define risk analysis.	BT1	Remember
21.	Define process hazard analysis.	BT1	Remember
22.	Identify the countermeasures against the freezing of valves.	BT1	Remember
23.	Give the reason for Port Hudson disaster.	BT5	Evaluate
24.	Write the significance of Rasmussen report.	BT1	Remember
25.	Define process hazard analysis.	BT1	Remember

PART - B (16 Marks)

S.No	QUESTIONS	Marks	Level	Competence
1	Describe Past accident analysis as information sources for Hazard analysis and consequences analysis of chemical accident as well as Mexico disaster and Bhopal disaster.	16	BT2	Understand
2	Explain the Feyzin disaster(1966)	16	BT1	Remember
3	Explain the Port Hudson disaster	16	BT2	Analyze
4	What are the reasons for industrial disasters? Briefly discuss any two major industrial disasters.	16	BT2	Understand
5	Formulate a hazard assessment study of non-nuclear installations.	16	BT4	Analyze
6	How can the past accident analysis act as an information source for hazard and consequence analysis. Explain with case studies.	16	BT4	Analyze
7	Explain the Emergency Planning procedure as per Seveso directive.	16	BT2	Understand
8	Summarize the reasons for the necessity of a reactor safety study of nuclear power plant.	16	BT4	Analyze
9	Explain Bhopal disaster and its effects.	16	BT2	Understand
10	Describe Port Hudson disaster in detail.	16	BT4	Analyze
11	Discuss in detail about reactor safety study on nuclear power plant.	16	BT1	Remember
12	Explain Rijnmond report with case study.	16	BT2	Understand
13	Write a detailed report on accident and consequences analysis of Mexico disaster.	16	BT4	Analyze
14	Explain the hazard assessment of non-nuclear installation	16	BT1	Remember
15.	Explain the Rijnmond report	16	BT4	Analyze
16.	Explain the various causes for the Feyzin explosion	16	BT2	Understand
17.	Discuss the various steps of failure involved in the massive explosion occurred at the flixborough with neat sketches.	16	BT4	Analyze