SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

M.E. INDUSTRIAL SAFETY ENGINEERING

QUESTION BANK

II SEMESTER

1914204 -SAFETY IN CHEMICAL INDUSTRIES

REGULATIONS – 2019

Academic Year 2019 – 20

Prepared by

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DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

SUBJECT : 1914204 -SAFETY IN CHEMICAL INDUSTRIES

SEM/YEAR: II / I

UNIT I - SAFETY IN PROCESS DESIGN AND PRESSURESYSTEM DESIGN			
Design process, conceptual design and detail design, assessment, inherently safer design- chemical reactor, types, batch reactors, reaction hazard evaluation, assessment, reactor safety, operating conditions, unit operations and equipments, utilities. Pressure system, pressure vessel design, standards and codes- pipe works and valves- heat exchangers- process machinery- over pressure protection, pressure relief devices and design, fire relief, vacuum and thermal relief, special situations, disposal- flare and vent systems- failures in pressure system.			
PART- A			
	Questions	**BT Level**	**Competence**
1.	Define the colour codes for safety in chemical Industries.	BT-1	Remembering
2.	List the examples for flammable and explosive chemicals.	BT-1	Remembering
3.	Define intensification in inherent safer design.	BT-1	Remembering
4.	List out any four steps to prevent local stress in a pressure vessel design.	BT-1	Remembering
5.	Define safety.	BT-1	Remembering
6.	What is flare?	BT-1	Remembering
7.	Explain design process.	BT2	Understanding
8.	Classify the various types of pressure relief valve.	BT2	Understanding
9.	Summarize the functions of a heat exchanger.	BT2	Understanding
10.	Demonstrate inherent safer design.	BT2	Understanding
11.	Illustrate about chemical reactor? And list its types.	BT3	Applying
12.	Explain about batch reactor and where are they used.	BT3	Applying
13.	Write the causes of failure in pressure system.	BT3	Applying
14.	What is reactor safety?	BT4	Analyzing
15.	Explain conceptual design and detail design.	BT4	Analyzing
16.	What is meant by pressure vessel design why it is done.	BT4	Analyzing
17.	What are the protections requires for over pressure?	BT5	Evaluating
18.	What are heat exchangers?	BT5	Evaluating
19.	Discuss the operating conditions for the reactors.	BT6	Creating
20.	Compile the standards and codes for pressure system.	BT6	Creating

PART - B

1.	What is conceptual design? Explain its elements and requirements for a good conceptual design.	BT1	Remembering
2.	What is various types of reactors and explain any three types of reactors.	BT1	Remembering
3.	What is a reactor? Explain the batch reactor with neat sketch.	BT1	Remembering
4.	Give a list of various standards and codes used in pressure vessel design.	BT1	Remembering
5.	Explain the factors to be considered in a design process.	BT2	Understanding
6.	Interpret the Reactor safety with a neat sketch.	BT2	Understanding
7.	Briefly explain about failures in pressure system.	BT2	Understanding
8.	Explain briefly the function of a heat exchanger with neat sketch.	BT3	Applying
9.	List the operating conditions required for the reactors in detail.	BT3	Applying
10.	Classify the various expected failures in a reactor and also suggest suitable measures to prevent them.	BT4	Analyzing
11.	What is over pressure and under which situation it occurs and list the protections reuired for over pressure.	BT4	Analyzing
12.	Elaborate the design aspects of high pressure relief devices used in the high level process industries.	BT4	Analyzing
13.	What are the functions of various pipe works and valves required for pressure system design.	BT5	Evaluating
14.	Discuss the failures in pressure system in detail.	BT6	Creating

PART - C

1.	What is reactor and state its function? Give its types and explain the reasons for failures. Justify your ideas about its inspection and maintenance.	BT1	Remembering
2.	Explain in detail the special situations under which various pressure relief devices are designed.	BT2	Understanding
3.	List various engineering and operational design aspects that are to be considered while formulating industrial safety standard and codes in a chemical process industry?	BT4	Analyzing
4.	Elucidate briefly how attenuation principle of inherent safer design to help a chemical industry to prevent accidents.	BT6	Creating

UNIT II - PLANT COMMISSIONINGAND INSPECTION			
Commissioning phases and organization, pre-commissioning documents, process commissioning, commissioning problems, post commissioning documentation Plant inspection, pressure vessel, pressure piping system, non destructive testing, pressure testing, leak testing and monitoring- plant monitoring, performance monitoring, condition, vibration, corrosion, acoustic emission-pipe line inspection.			
PART – A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Define performance monitoring.	BT1	Remembering
2.	What are the precautions to be adopted to ensure safety in storage and handling of corrosive liquids?	BT1	Remembering
3.	List the problems arised in commissioning phase of a chemical industry.	BT1	Remembering
4.	Why it is called as pressure vessel?	BT1	Remembering
5.	List out the advantages of NDT.	BT1	Remembering
6.	What is pre-commissioning?	BT1	Remembering
7.	Summarize the preparatory measures before undertaking a pressure test for a vessel.	BT2	Understanding
8.	Give the meaning of corrosion.	BT2	Understanding
9.	Give the flowchart for commissioning process.	BT2	Understanding
10.	What is meant by pipe line Inspection?	BT2	Understanding
11.	What is meant plant monitoring system?	BT3	Applying
12.	List the control systems required for the plant.	BT3	Applying
13.	What are the Non destructive test carried for plant.	BT3	Applying
14.	List the facility commissioning issues.	BT4	Analyzing
15.	What are the associated services?	BT4	Analyzing
16.	Define purging.	BT4	Analyzing
17.	What is meant by acoustic emission?	BT5	Evaluating
18.	What can be done before mechanical completion?	BT5	Evaluating
19.	Define NDT.	BT6	Creating
20.	What is performance montoring?	BT6	Creating

PART - B

1.	What is meant by corrosion and what are all should be done to avoid corrosion.	BT1	Remembering
2.	What is basic pressure test method and also discuss hydro and pneumatic pressure test in detail.	BT1	Remembering
3.	Explain pre-commissioning documentation.	BT1	Remembering
4.	List the various procedures to be followed to ensure safe commissioning activities. Elaborate in detail.	BT1	Remembering
5.	Explain in detail about the commissioning process with a	BT2	Understanding

	flowchart.		
6.	Explain briefly the details about pressure testing with neat sketch.	BT2	Understanding
7.	What is NDT and explain any two test in detail.	BT2	Understanding
8.	Identify various types of inspection to be carried out in a commissioning phase.	BT3	Applying
9.	Explain pre commissioning, process commissioning and post commissioning.	BT3	Applying
10.	Explain in detail with flowchart about the commissioning charge?	BT4	Analyzing
11.	Prepare a check list for a plant inspection and explain it.	BT4	Analyzing
12.	Explain in detail about the facility commissioning issues.	BT4	Analyzing
13.	Sketch and explain the leak proof testing.	BT5	Evaluating
14.	What are the equipment system activities explain in detail?	BT6	Creating

PART - C

1.	Discuss the various safety aspects during the commissioning of a chemical plant and its method of documentations..	BT1	Remembering
2.	Summarize in detail the various NDT techniques to be followed during the testing of high pressure piping system.	BT2	Understanding
3.	Give a brief detail of Pre-commissioning and Post commission documents	BT4	Analyzing
4.	Explain Comma ray radiographic testing and Ultrasonic testing for ferrous materials.	BT6	Creating

UNIT III – PLANT OPERATIONS			
Operating discipline, operating procedure and inspection, format, emergency procedures- hand over and permit system- start up and shut down operation, refinery units- operation of fired heaters, driers, storage- operating activities and hazards- trip systems- exposure of personnel			
PART – A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	List out the steps of Hand over permit system in Chemical Industries.	BT1	Remembering
2.	Write short notes on trip system.	BT1	Remembering
3.	Define Trip.	BT1	Remembering
4.	List any four hazards in a refinery plant.	BT1	Remembering
5.	Name the various operating procedures.	BT1	Remembering
6.	List the two major hazards occurred in fire heaters operation.	BT1	Remembering
7.	Indicate the limitations of operating envelop in a chemical plant.	BT2	Understanding

8.	State the hand over and permit system.	BT2	Understanding
9.	State the importance of WP.	BT2	Understanding
10.	Give the expected hazards in a chemical industry.	BT2	Understanding
11.	Write about inspection format in plant operation.	BT3	Applying
12.	What is meant by shutdown operation?	BT3	Applying
13.	What is the operation of fired heater?	BT3	Applying
14.	What is exposure of personnel?	BT4	Analyzing
15.	Difference between emergency procedure and normal operating procedure.	BT4	Analyzing
16.	What is Operating Discipline(OD)?	BT4	Analyzing
17.	List the methods of mock drill.	BT5	Evaluating
18.	Give the operation of fired storage.	BT5	Evaluating
19.	What are all the opertaions carried during shut down?	BT6	Creating
20.	Define start up operation.	BT6	Creating

PART- B

1.	Write about work permit system briefly.	BT1	Remembering
2.	What are the precautions to be made in start up and shut down operation of a Fired Heater?	BT1	Remembering
3.	Explain in detail about the check list to be done in shutdown operation?	BT1	Remembering
4.	How will you control the hazards of the chemical industry while plant is in operation stage.	BT1	Remembering
5.	Illustrate in detail about Operating discipline and Operating procedure	BT2	Understanding
6.	Summarize in detail about Inspection format and Emergency Procedure.	BT2	Understanding
7.	Summarize the hazards in a plant.	BT2	Understanding
8.	Elaborate in detail about the operation of fired heaters, driers and storage.	BT3	Applying
9.	State the importance of hand over and permit system with a case study.	BT3	Applying
10.	What are the requirements for storage of chemicals in a manner that is safe and in accordance with the Dangerous Goods Safety Management Regulations?	BT4	Analyzing
11.	List the procedure for ensuring safety in chemical industry during emergency.	BT4	Analyzing
12.	Discuss in detail about the check list to be done before hand over of the plant to the owner/client.	BT4	Analyzing
13.	Explain the safety trip system and interlock system needed for plant operation.	BT5	Evaluating
14.	Elaborate the Operating Discipline(OD) in detail.	BT6	Creating

PART - C

1.	Discuss the safe start up and shut down procedure to be followed with an example of refinery plant.	BT1	Remembering
2.	Explain in detail the types and methods of mock drill to be carried out when the plant is nearer to residential avenues.	BT2	Understanding
3.	Discuss the various engineering, technical and electrical devices that must be installed in various parts of a plant to prevent hazards.	BT3	Applying
4.	List the various types of operating discipline and explain any three in detail.	BT4	Analyzing

UNIT – IV - PLANT MAINTENANCE, MODIFICATION AND EMERGENCYPLANNING

Management of maintenance, hazards- preparation for maintenance, isolation, purging, cleaning, confined spaces, permit system- maintenance equipment- hot works- tank cleaning, repair and demolition- online repairs- maintenance of protective devices- modification of plant, problemscontrols ofmodifications. Emergency planning, disaster planning, onsite emergency- offsite emergency, APELL

PART-A

Q.No	Questions	BT Level	Competence
1.	What are the common protective devices in process industry?	BT1	Remembering
2.	List account of safety aspects during chemical tank cleaning.	BT1	Remembering
3.	Specify how purging helps to prevent the accidents.	BT1	Remembering
4.	List the various depressurization methods to protect from over pressure.	BT1	Remembering
5.	What do you mean by purging.	BT1	Remembering
6.	Define Maintenance.	BT1	Remembering
7.	State APELL.	BT2	Understanding
8.	Classify the various types of emergency planning in a plant.	BT2	Understanding
9.	What is mean by Hazard?	BT2	Understanding
10.	Summarize the types of maintenance work.	BT2	Understanding
11.	What is meant by protective device maintenance?	BT3	Applying
12.	Define confined space maintenance.	BT3	Applying
13.	List the problems of modification of plant.	BT3	Applying
14.	How will you control modifications of plant.	BT4	Analyzing
15.	Define offsite and onsite emergency plan.	BT4	Analyzing
16.	Write the elements of Emergency planning.	BT4	Analyzing
17.	Why tank cleaning is done in industry?	BT5	Evaluating
18.	Define repair?	BT5	Evaluating
19.	What is meant by demolition?	BT6	Creating
20.	Write about maintenance of protective devices.	BT6	Creating

PART- B

1.	Briefly explain about APELL.	BT1	Remembering
2.	Write short notes on Purging and Cleaning.	BT1	Remembering
3.	Write short notes on Confined space and Disaster planning.	BT1	Remembering
4.	Briefly explain about various types of maintenance and explain any one in detail.	BT1	Remembering
5.	Discuss the modification of plant.	BT2	Understanding
6.	Explain briefly about Preparation for Maintenance and Isolation	BT2	Understanding
7.	Explain briefly about Permit Systems and controls of modifications.	BT2	Understanding
8.	Explain in detail about tank cleaning in chemical industries?	BT3	Applying
9.	What is online repair and explain detail online leak sealing?	BT3	Applying
10.	Explain in detail about onsite and offsite emergency?	BT4	Analyzing
11.	What are the important safety factors that are to be followed while designing a process layout?	BT4	Analyzing
12.	Analyze in detail about disaster management plan for chemical industries?	BT4	Analyzing
13.	Explain on safety in preventive and emergency maintenance operations.	BT5	Evaluating
14.	Compile the check list for special maintenance; corrosion and erosion.	BT6	Creating

PART – C

1.	Explain how the safe movement of men and material can be designed in an industrial layout, giving a typical sketch of a layout.	BT3	Applying
2.	Explain in detail, the causes of serious accidents in the chemical industries during the maintenance work in equipment and precautions to avoid such accidents.	BT5	Evaluating
3.	List out the importance of emergency planning. Explain in detail the contents of onsite emergency plan with a suitable example.	BT6	Creating
4.	During modifications in a plant causes many hazards. Justify this statement with examples.	BT2	Understanding

UNIT-V-STORAGES
General consideration, petroleum product storages, storage tanks and vessel- storages layout segregation, separating distance, secondary containment- venting and relief, atmospheric vent, pressure, vacuum valves, flame arrestors, fire relief- fire prevention and protection- LPG storages, pressure storages, layout, instrumentation, vapourizer, refrigerated storages- LNG storages, hydrogen storages, toxic storages, chlorine storages, ammonia storages, other chemical storages- underground storages- loading and unloading facilities- drum and cylinder storage- ware house, storage hazard assessment of LPG and LNG

PART – A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Define Underground storage.	BT1	Remembering
2.	What are the various safety devices to be used during undergroung storage of Chemical?	BT1	Remembering
3.	Mention the result of roll over in LNG storage.	BT1	Remembering
4	How the consequence will be mitigated in the storage area with due consideration of layout?	BT1	Remembering
5.	What is the Precautions to be carried for LPG Storages?	BT1	Remembering
6.	What for flame arrestors are used?	BT1	Remembering
7.	List the various methods of storage devices?	BT2	Understanding
8.	Explain the principles of Fire Extinguishers.	BT2	Understanding
9.	Point out the precautions to be carried out before tank cleaning.	BT2	Understanding
10.	Differentiate LPG and LNG.	BT2	Understanding
11.	Define Warehouse storages?	BT3	Applying
12.	Define storage hazard assessment?	BT3	Applying
13.	How will you store petroleum product?	BT3	Applying
14.	What is meant by fire prevention and fire protection?	BT4	Analysing
15.	What is flame arrestors?	BT4	Analysing
16.	What is the meant by secondary containment?	BT4	Analysing
17.	What are the hazards in ammonia storages?	BT5	Evaluating
18.	How will you store chlorine?	BT5	Evaluating
19.	How is Hydrogen stored?	BT6	Creating
20.	Explain the importance of cold storages.	BT6	Creating

PART – B

1.	Explain elaborately the LNG storage details.	BT1	Remembering
2.	List the hazards and safety procedure followed in the storage of toxic chemicals in the Industries.	BT1	Remembering
3.	Give the safety guidelines for LNG facilities in the Industry.	BT1	Remembering
4.	What are the general requirements and approved Codes of Practice apply to the Safe Storage of LPG.	BT1	Remembering
5.	Illustrate about storage hazards in detail.	BT2	Understanding
6.	Explain in detail about fire prevention and protection in Chemical Industries.	BT2	Understanding
7.	Justify your comments on general considerations in storage.	BT2	Understanding
8.	Design and discuss safety system to store LPG in bullets.	BT3	Applying
9.	Discuss various codes and standards for storing and transit of chemicals.	BT3	Applying
10.	How is hydrogen stored explain in detail about the storage system.	BT4	Analysing

11.	Explain in detail about the applications of refrigeration in chemical and process industries.	BT4	Analysing
12.	List the precautions to be carried in petroleum product storages?	BT4	Analysing
13.	How storage tanks and vessels are used in refineries and give other classification of storage tank based on loction in refineries.	BT5	Evaluating
14.	What is a flame arrestor, list the uses of flame arrestors also explain the types of flame arrestor.	BT6	Creating

PART - C

1.	Explain the various precautions and facilities to be considered and provided in LPG storage with a layout.	BT2	Understanding
2.	Specify the main purposes of providing secondary containment. Also state the various provisions given in the storage of chemicals in a tank farm.	BT3	Applying
3.	Write the hazard prevention measures to be followed in a ware house storage to store different kinds of materials.	BT4	Analysing
4.	List out the precautions to be made in chlorine storage, ammonia storage and drum and cylinder storages.	BT5	Evaluating

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QUESTION BANK

S.no	Unit		BT1	BT2	BT3	BT4	BT5	BT6	Total Questions
1	Unit-1	Part-A	6	5	4	4	3	3	25
		Part-B	4	3	2	3	1	1	14
		Part-C	1	1	-	1	-	1	4
2	Unit-2	Part-A	6	5	4	4	3	3	25
		Part-B	4	3	2	3	1	1	14
		Part-C	1	1	-	1	-	1	4
3	Unit-3	Part-A	6	5	4	4	3	3	25
		Part-B	4	3	2	3	1	1	14
		Part-C	1	1	1	1	-	-	4
4	Unit-4	Part-A	6	5	4	4	3	3	25
		Part-B	4	3	2	3	1	1	14
		Part-C	-	1	1	-	1	1	4
5	Unit-5	Part-A	6	5	4	4	3	3	25
		Part-B	4	3	2	3	1	1	14
		Part-C	-	1	1	1	1	-	4

PART-A	125
PART-B	70
PART-C	20
TOTAL	215