Name:
Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2021

Programme Name: MBA Oil & Gas | **Semester :IV**
Course Name : HSE for Petroleum Sector | **Time: 03hrs**
Course Code : OGOG 8002 | **Max. Marks: 100**
Nos. of page(s) :3

SECTION A

S. No.		Marks	CO
Q.1	Briefly write: I. CPCB -- II. ALARP is -- III. QRA is --- IV. COD -- V. OISD is ---	**5**	**CO1**
Q.2	Write Short Notes on: • MIS • Pool Fire	**5**	**CO2**
Q.3	List out various direct & indirect impact of an accident.	**5**	**CO2**
Q.4	Discuss important points of Motor vehicle act related to safety.	**5**	**CO2**
Q.5	Discuss work permit systems and its role in reduction of accidents in industries.	**5**	**CO4**
Q.6	Define noise pollution and effects of noise pollution.	**5**	**CO2**

SECTION B

Q.7	Demonstrate your knowledge on Safety related procedures and safety related rules of oil & gas industry	**10**	**CO3**
Q.8	Assessment of risk in oil & gas industry can help in avoiding major accidents. Discuss objectives of risk and components of risk assessment.	**10**	**CO5**
Q.9	A well-written onsite & offsite emergency management plan can play crucial role in management of any types of disaster. What is disaster management plan? Write in detail about DMP for a petrochemical plant.	**10**	**CO5**
Q.10	Air pollution due to vehicular movement and industrialization is beyond standard value in most of the metro cities of India. Describe various control equipment for air pollution control.	**10**	**CO5**
Q.11	HSE audit is an important study for most of the hazardous industries. Describe different types of HSE audit conducted for offshore rig.	**10**	**CO3**

SECTION-C			
Q.10	Find out major causes of the disaster in current case study & your learning as safety officer from this accident?	**20**	**CO5**

CASE STUDY

BP Texas Refinery case study

On March 23, 2005, a BP Texas City Refinery distillation tower experienced an overpressure event that caused a geyser-like release of highly flammable liquids and gases from a blow down vent stack. An explosion occurred when heavier than air hydrocarbon vapors combusted after coming into contact with an ignition source, probably a running vehicle engine. Vapour clouds ignited, killing 15 workers and injuring 170 others. The accident also resulted in significant economic losses and was one of the most serious workplace disasters in the past two decades. The total cost of deaths and injuries, damage to refinery equipment, and lost production was estimated to be over $2 billion.

Oil refineries vaporize crude oil in a furnace and then separate its various components in a distillation tower (sometimes called a raffinate splitter tower or a fractionating column) based on the different condensation points of the constituent gases. As the hot vapour rises in the tower, horizontal trays set at progressively lower temperatures collect the different components as they condense into liquids, which are then continuously drawn off into separate containers. A distillation tower can process (or separate) thousands of barrels per day of highly flammable crude oil into its constituent hydrocarbons for commercial consumption. When the tower is operating normally, overflow pipes drain the condensed liquids from each tray to the tray be- low, where the higher temperature causes re-evaporation. Uncondensed fixed gases at the top and heavy fuel oils at the bottom are also continuously drawn off and recycled through the tower.

In addition, normal operations would typically include a high and low level liquid detector in the distillation tower to indicate abnormal process conditions, activate alarms, and initiate programmed release of gas/fluid to the blow- down drum, which is usually equipped with a flare system to burn the vapours in a controlled setting.

Management decisions to continue operating with an atmospherically vented blow down stack in lieu of the widely available, and inherently safer, flare tower was an important factor. The distillation tower liquid level detection system was not designed to measure levels above a maximum height of ten feet, providing no insight into off nominal operational scenarios. The tower liquid level reached an estimated height of 138 feet immediately prior to the over- pressure event.

Subsequent investigative reports pointed to a strong cost- cutting focus by BP senior management that resulted in a lack of adequate training and supervision of filling and operating the distillation tower. Fundamental procedural errors led to overfilling the distillation tower, overheating, liquid release, and the subsequent explosion. Unit super- visors were absent during critical parts of the startup, and unit operators failed to take effective action to control deviation from the process or to sound evacuation alarms after the pressure relief valves opened.

The BP safety and quality assurance inspection and monitoring processes were absent and/or ineffective as a barrier to this failure chain. In addition, there was inadequate local, State, and Federal government safety over- sight.

The majority of 17 startups of the distillation tower from April 2000 to March 2005 had exhibited abnormally high internal pressures and liquid levels, including several occasions where pressure relief valves likely opened. However, the abnormal startups were not investigated as "near-misses," and the adequacy of the tower's design, instrumentation, and process controls were not reevaluated.

The startup of the distillation tower on March 23 was authorized despite reported problems with the tower level detector/transmitter, the high-level alarms on the tower, and the blow down drum. For example, a work order dated on March 10 acknowledged with management approval that a level detector/transmitter needed repairs but indicated that these repairs would be deferred until after startup. A control valve associated with pressure relief was also reported to have malfunctions prior to the accident. These pre-existing conditions were confirmed by the U.S. Chemical Safety Board (CSB). This release valve mal-functioned and contributed to the accident by not relieving the overpressure in a controlled manner.

Additionally, a key alarm failed to operate properly and to warn operators of unsafe conditions within the tower and the blow down drum.