

B.E. CHEMICAL ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2025

CHEMICAL PROCESS SAFETY & RISK MANAGEMENT(HONS.)

Time: 3 hours

Total Marks:100

Answer any five questions.

Assume any missing data.

1. a) Briefly describe the failures of the following
 - i) Failures of pipe, ii) Failure of pumps 5 x 2
 - b) Briefly describe flames for pool fires. 10[CO3+CO4]
2. i. Air contains 10 ppm of diethylamine (TLV-TWA of 10 ppm), 30 ppm of cyclohexanol (TLV-TWA of 40 ppm), 10 ppm of propylene oxide (TLV-TWA of 20 ppm). What is the mixture TLV-TWA and has this level been exceeded? [15]

 ii. Briefly describe different extinguishing system used in fire protection of industry. [5]
[CO2]
3. Briefly describe the following: [4 x 5]
[CO1]
 - i. Blast waves
 - ii. Unconfined vapor cloud explosions
 - iii. Reactors failure
 - iv. LC_{50} and LD_{50}
4. Briefly describe the disasters of Bhopal, India and Boston (USA). [10 x 2]
[CO2]
5. i. Define hazard and types of hazard in process Industries.
 - ii. The EPA has calculated that unit lifetime risk from exposure to ethylene dibromide (EDB) in drinking water is 0.80 LCF per 10^5 persons. What risk is experienced by drinking water with an average EDB concentration of 5 $\mu\text{g/L}$ for five years?
 - iii. A process has a reported FAR of 2. If an employer works a standard 8 hr shift – 300 days per year, compute the death per person per year 5+8+7[CO1+CO4]
6. i. What are the key points of ALARP.
 - ii. Briefly describe Failure Mode and Effects Analysis (FMEA) and its principles.
 - iii. Briefly describe fault tree and event tree analysis of fire in a plant.
 - iv. Define potency factor, and hazard quotient.4+4+6+6
[CO1+CO2+CO4]