

M.E. CHEMICAL ENGINEERING FIRST YEAR SECOND SEMESTER - 2017, 1st Year, 2nd Semester

POLLUTION CONTROL AND SAFETY IN PROCESS INDUSTRIES

Time – Three hours

Full marks –100

Answer any five questions

1. a) What is the source of pool fires? Discuss about the duration of pool fires and the shape of flames from pool fires. [8]
b) What is the fireball. How do you calculate the duration and power of a fireball. Discuss about the radiative flux and surface temperature of the fireball. [12]
2. a) Write about the different classification of fire. What are the various fire extinguishing systems used for different classes of fire. [10]
b) Discuss about the possible failures and hazards associated with either Reactors or Heat exchangers. [10]
3. What is fault tree analysis of accidents. Considering the head event of explosion in a furnace, Describe the method of carrying out fault tree analysis of this event in the furnace. [20]
4. a) With the meaning, mention the different guide words used in HAZOP studies. [8]
b) Prepare a flowsheet for the continuous process for the production of diammonium phosphate (DAP). In this process the phosphoric acid and ammonia are mixed and non-hazardous DAP results if the reaction of ammonia is complete. Do the HAZOP study which will identify the hazards and operability problems for the above process. Also suggest the remedial measured for the identified problems. [12]
5. Write the different causes of the possible deviations of the following operating parameters from their design values in case of a chemical process plant safety. [20]
 - a) Pressure deviations.
 - b) Temperature deviations.
 - c) Flow deviations.
 - d) Level deviations.
6. With the help of examples, state the possibilities of accidents that may be caused by human error from the following cases: [20]
 - a) Wrong valve closed.

b) Wrong valve opened.

c) Abnormal reading unnoticed on panel instrument.

7. Discuss about the typical pipe and valve failures and give also the reasons for their occurrence for the following cases. [20]

a) Dead end formation at a steam connection.

b) Corrosion resulted from collected water.

c) Water collected at the dead end

8. Write notes on (any four) [20]

a) Blast waves.

b) Boiling Liquid Expanding Vapor Explosions

c) Runaway reaction.

d) Deflagration and Detonation.

e) LD₅₀ and LC₅₀.

f) Classification of dangerous goods.

g) Safety valves.