

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)**

**CLASS: BE**  
**BRANCH: CHEM ENGG. / CEP&P**

**SEMESTER: VII**  
**SESSION : MO/2019**

**SUBJECT : CL7007 SAFETY AND HAZARDS IN CHEMICAL INDUSTRY**

**TIME: 1.5 HOURS**

**FULL MARKS: 25**

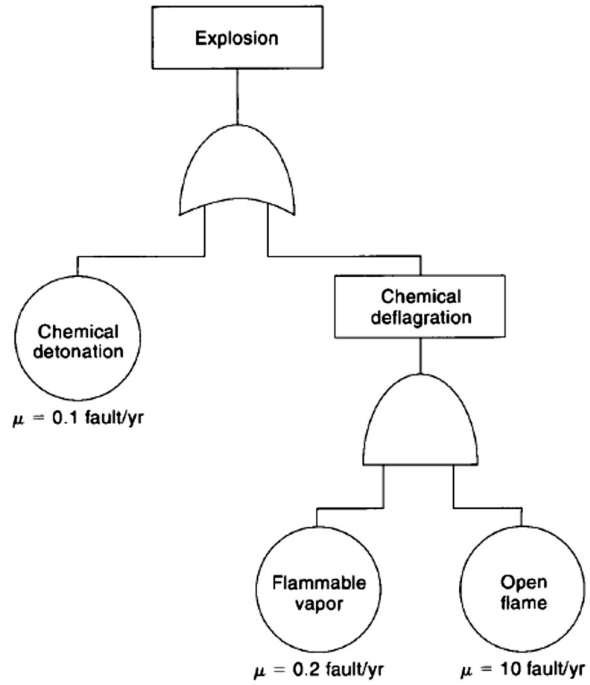
**INSTRUCTIONS:**

1. The total marks of the questions are 30.
  2. Candidates may attempt for all 30 marks.
  3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. The missing data, if any, may be assumed suitably.
- 

- Q1 (a) Define the following terms: [2]  
i. Loss prevention  
ii. Risk  
iii. Acceptable risk  
iv. Tolerable risk  
(b) What is wind rose diagram and how it is created? Explain how wind rose diagram is important in chemical process industry. [3]
- Q2 (a) What are the scientific principles that must be successfully completed in order to prevent a repeat event of similar nature? [2]  
(b) What are the objectives and contains of the emergency plan? [3]
- Q3 (a) Describe "Fire Pyramid" and its different components. [2]  
(b) Develop expressions for the estimation of flammability limits using stoichiometry concentration of fuel. [3]
- Q4 (a) If the UFL for a substance is 11% by volume at 0.0 MPa gauge, what is the UFL at 6.2 MPa gauge? [2]  
(b) One thousand Kilograms of methane escapes from a storage vessel, mixes with air and explodes. Determine: [3]  
(i) Equivalent amount of TNT  
(ii) Scaled distance at 50 m from the blast  
Assuming an explosion efficiency of 2%. The Heat of combustion of methane is 51,168.75 KJ/kg and energy of explosion of TNT is 4686 KJ/kg.
- Q5 (a) Assume an automobile has four independent and identical tires. The tire reliability is 0.97. If any one of the tires is punctured, the automobile cannot be driven. Estimate the automobile reliability and failure probability. [2]  
(b) What differences exist between event tree and fault tree analysis? [3]
- Q6 (a) What do you mean by revealed failure and unrevealed failure? [2]

**PTO**

(b) Determine MTBF and reliability of the top event (explosion) of the system shown in Figure. [3]



:::: 24/09/2019M ::::