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| Name: |  |
| Enrolment No: | |

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Chemical Process Safety (FSEG-312)

Semester: VI

Program: BTech Fires and Safety Engineering

Time: 03 hrs.

Max. Marks: 100

Instructions: Students are advised to answer questions sequentially and start each answer of a new sheet of paper.

SECTION A

All the questions are compulsory (Max marks 4 x 5 = 20)

| S. No. | Question | Marks |
|--------|--|----------|
| Q1 | Which one is more risky to handle i) Flammable material or ii) Combustible material, and why? | 5 |
| Q2 | Give broad classification of inspection techniques and list any three techniques under each category. | 5 |
| Q3 | What are the various stages in plant commission and the critical dates corresponding to points in various stages of commissioning? | 5 |
| Q4 | Why reactivity is treated as a process hazard? Give examples of reactivity as a process hazard. | 5 |

SECTION B

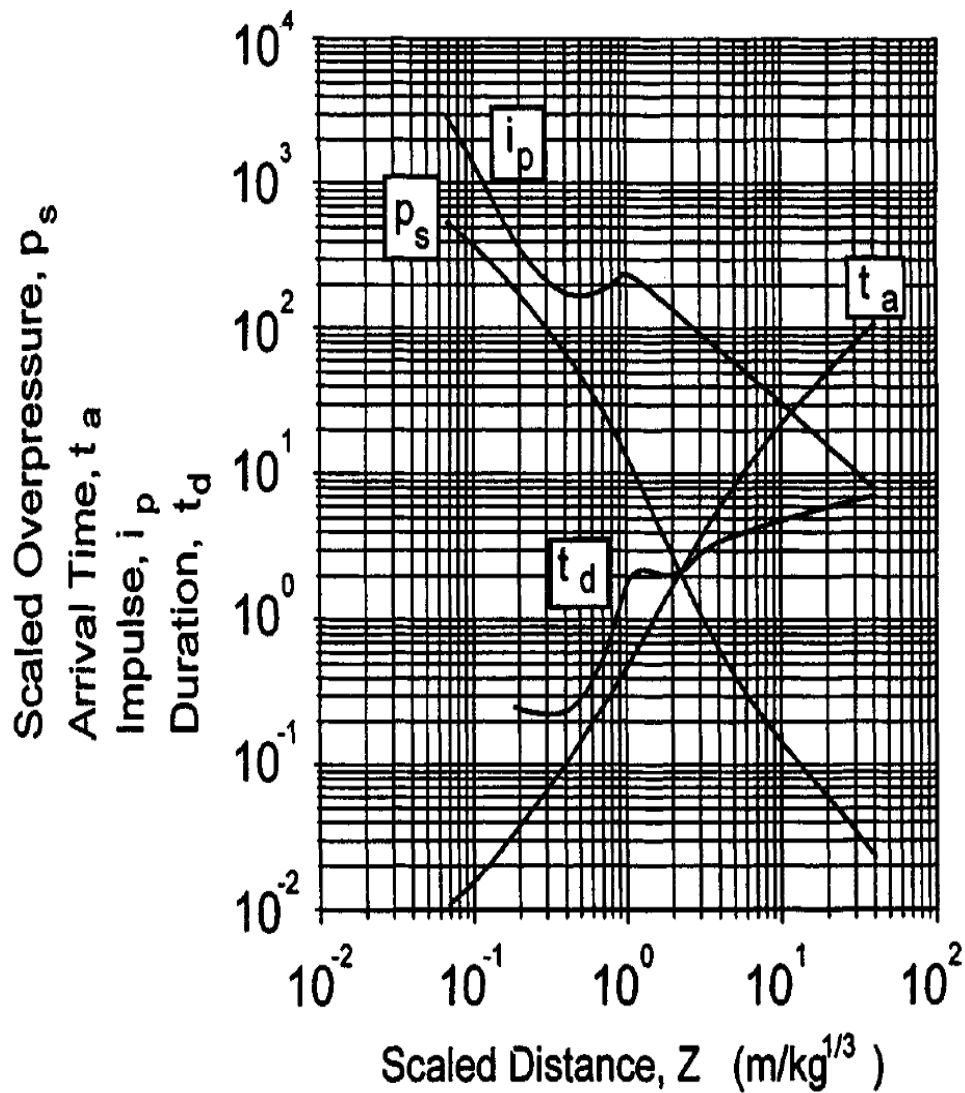
All questions are compulsory (Max marks 4 x 10 = 40)

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| Q5 | Describe the methods used for primary screening of explosive materials. <i>Or</i> What are stability and sensitivity tests? Describe in detail the various stability and sensitivity tests? | 10 |
| Q6 | How many types of control valves are employed in a hydraulic systems? Describe each with the help of diagrams. | 10 |
| Q7 | Explain the concept of bonding and grounding in lightening protection. What are lightening arresters and what is the best location for placement of lightening arresters? | 10 |
| Q8 | What is QRA and when is it done? Give an overview of risk analysis methods. | 10 |

SECTION-C

Answer any two question from this section (Max marks 2 x 20 = 40)

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|--------|---|-----------|
| Q9 (a) | What are the limitations associated with use of TNT equivalency model for estimation of overpressure from a vapour cloud explosions? Describe the difference between detonation and deflagration. | 12 |
| (b) | A 10-kg mass of TNT explodes on the ground. Determine the overpressure, arrival time, duration time, and impulse 50 m away from the blast using the following TNT chart. | 8 |



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| Q10 | Pressure relief is must to ensure that a plant operates safely and is no untoward outcome is witnessed in case of incident that may lead to rise in pressure. Explain with the help of a diagram various steps that are involved in designing a pressure relief system. | 20 |
| Q11 | Identification of hazard is key to ensuring safety at a chemical plant. What are the five questions that every safety officer must know in order to ensure safety? Define various types of hazards and discuss the methods employed to tackle these hazards. | 20 |