

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Course: Hazard Identification & HAZOP Program: B. Tech. (Fire and Safety) Course Code: FSEG 423	Semester: VII Time: 3 Hrs. Marks: 100
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Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Describe simplification approach in inherent safety with few examples.	5	CO1
Q 2	Draw the flowchart for calculating Airborne Quantity.	5	CO2
Q 3	How to incorporate SIL in Risk matrix?	5	CO2
Q 4	Name any 5 process control credit factors.	5	CO1

SECTION B

Q 5	What is HAZOP? List down 6 guidewords and describe the deviation of parameters related with individual guideword. Draw and discuss the flow chart of HAZOP procedure.	10	CO3																								
Q 6	Calculate F&EI and mention degree of Hazard using below mentioned data: <table border="1" style="margin: 10px auto; width: 80%;"> <thead> <tr> <th style="width: 25%;">General Process Hazard Factors</th> <th style="width: 15%;">Penalty value</th> <th style="width: 25%;">Special process Hazard factor</th> <th style="width: 35%;">Penalty value</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">0.5</td> <td style="text-align: center;">P</td> <td style="text-align: center;">0.1</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">0.3</td> <td style="text-align: center;">Q</td> <td style="text-align: center;">0.6</td> </tr> <tr> <td style="text-align: center;">C</td> <td style="text-align: center;">0.8</td> <td style="text-align: center;">R</td> <td style="text-align: center;">2.1</td> </tr> <tr> <td style="text-align: center;">D</td> <td style="text-align: center;">1.0</td> <td style="text-align: center;">S</td> <td style="text-align: center;">0.4</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">T</td> <td style="text-align: center;">0.75</td> </tr> </tbody> </table> Consider overall value of MF = 24.	General Process Hazard Factors	Penalty value	Special process Hazard factor	Penalty value	A	0.5	P	0.1	B	0.3	Q	0.6	C	0.8	R	2.1	D	1.0	S	0.4			T	0.75	10	CO4
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Q 7	Suppose a 70 kg man is exposed to 0.1 mg/m ³ tetra-chloro-ethylene in the air at his workplace. If he inhales 1 m ³ /h, work time 8h/day, 5 day/week, 50 week/year for 30 years. What would be his lifetime cancer risk? Assume, Absorption rate of tetra-chloro-ethylene 90% and inhalation potential factor 2*10 ⁻³ (mg/kg-day) ⁻¹	10	CO4																								
Q 8	Describe how to quantify the probability of Top event in FTA with suitable example. <p style="text-align: center;">OR</p> Describe step by step procedure of ETA to find out probability of certain event sequences.	10	CO3																								

SECTION-C

Q 9	<p>Explosive chemical (in liquid phase) is stored in a sphere at 41 °F. A 2- inch nozzle fails on the bottom of the vessel allowing liquid to escape. Calculate, CEI and HD for given Information:</p> <p>Pressure inside the cylinder = 330 kPa (gauge pressure), Diameter of hole = 51 mm, height of liquid = 6m, Liquid density = 1458 kg/m³. Capacity of sphere = 1.134*10⁶ kg, Liquid releasing time = 900 sec, normal boiling point temperature = - 34°C, Heat of vaporization = 285457 J/kg, Heat capacity = 943.8 J/kg/°C, ERPG-1 = 17 mg/m³, ERPG-2 = 139 mg/m³, ERPG-3 = 696 mg/m³.</p> <p>Assume other values, if required.</p>	20	CO5
Q 10	<p>i. What is HAZCHEM Code? Describe first, second and third digits of HAZCHEM Code.</p> <p>ii. Explain properties of chemicals from below mentioned HAZCHEM Code:</p> <p>a. 2 P E</p> <p>b. 3 <input type="checkbox"/> Y</p> <p>iii. Explain how to determine HAZCHEM Codes for Mixtures.</p> <p style="text-align: center;">OR</p> <p>i. List all codes of EPA-Compatibility for mixing two chemicals. Prepare an EPA-Compatibility matrix.</p> <p>ii. Discuss basic Rules for Segregation of Unknown Chemicals for Compatibility check.</p>	20	CO3 /CO 4