Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Program: B.Tech.-Fire and Safety Engineering **Semester: V**

Course: Safety and risk engineering **Time : 03 hrs.**

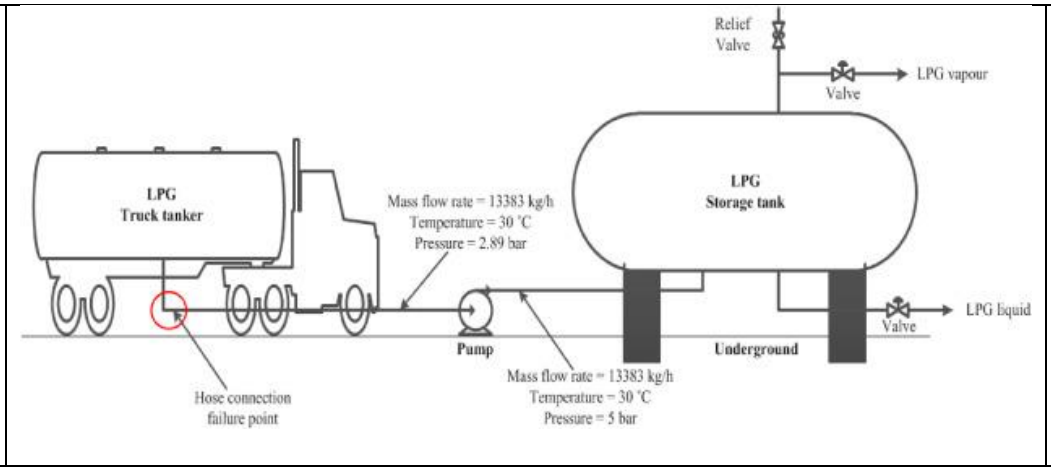
Course Code: HSFS 3035P **Max. Marks: 100**

No of pages: 3

Instructions: Read the question properly and give the most relevant answer.

SECTION A
(5Qx4M=20Marks)

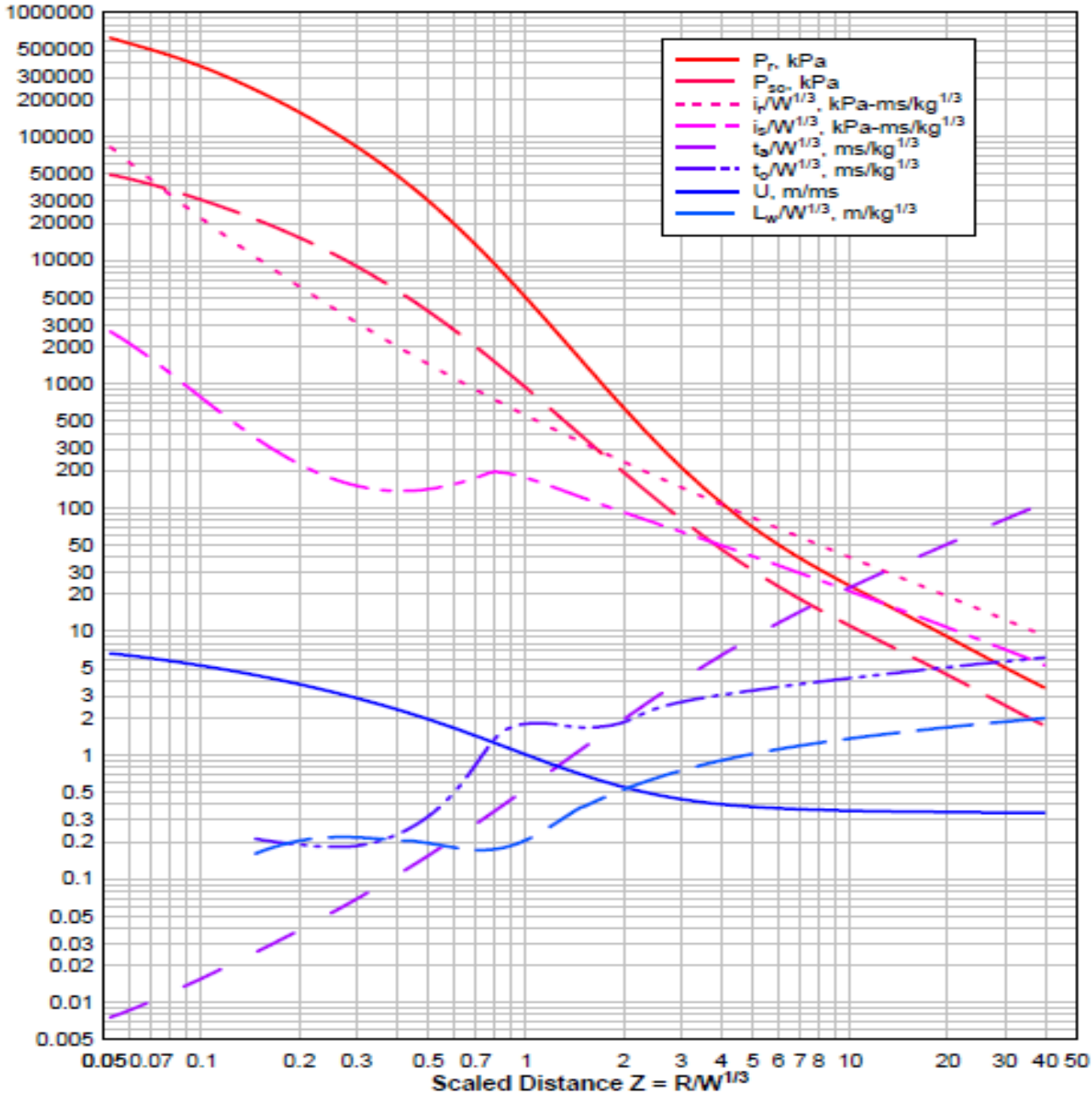
S. No.		Marks	CO
Q 1	Differentiate risk assessment and risk management.	**4**	**CO3**
Q 2	Define hazard and risk with an example	**4**	**CO1**
Q 3	Differentiate safety and security with an example.	**4**	**CO3**
Q 4	Explain ALARP with example.	**4**	**CO2**
Q 5	Explain Hopkinson scaling law.	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Perform a FMECA study for a food delivery process to a home through Zomato during a rainy day.	**10**	**CO3**
Q 7	Explain the concept of HazOp study in detail.	**10**	**CO2**
Q 8	Perform an FTA for the absenteeism of the student in a class and comment on the advantages of FTA.	**10**	**CO3**
Q 9	Explain the steps involved in finding the probit equation for a toxic chemical. (OR) Analyze what if analysis and checklist analysis in detail with procedure, advantages and disadvantages.	**10**	**CO3**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	Discuss the principle of operation of Accelerating rate calorimetry (ARC) with suitable sketch highlighting its applications. .	**20**	**CO2**
Q 11	You have been assigned a job to assess the damage due to explosion caused by an explosive of 1500 kg stored at port, whose specific heat is 2000 J/g C^o, Initial onset of exothermicity is 150 C^O and end exothermic temperature is 250 C^O for 1 g for explosive and Heat of reaction of TNT is 4200J/g. Find the explosion damages caused in human beings at 50 m and 100 m respectively. Consider air blast explosion condition for assessment. (OR) Elaborate the ETA, its procedure elloborately. and perform Check list analysis and What if analysis for unloading of flammable petroleum product from truck to bullet storage tank.	**20**	**CO4**



Probit table

%	0	1	2	3	4	5	6	7	8	9
0		2.67	2.95	3.12	3.25	3.36	3.45	3.52	3.59	3.66
10	3.72	3.77	3.82	3.87	3.92	3.96	4.01	4.05	4.08	4.12
20	4.16	4.19	4.23	4.26	4.29	4.33	4.36	4.39	4.42	4.45
30	4.48	4.50	4.53	4.56	4.59	4.61	4.64	4.67	4.69	4.72
40	4.75	4.77	4.80	4.82	4.85	4.87	4.90	4.92	4.95	4.97
50	5.00	5.03	5.05	5.08	5.10	5.13	5.15	5.18	5.20	5.23
60	5.25	5.28	5.31	5.33	5.36	5.39	5.41	5.44	5.47	5.50
70	5.52	5.55	5.58	5.61	5.64	5.67	5.71	5.74	5.77	5.81
80	5.84	5.88	5.92	5.95	5.99	6.04	6.08	6.13	6.18	6.23
90	6.28	6.34	6.41	6.48	6.55	6.64	6.75	6.88	7.05	7.33
	0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
99	7.33	7.37	7.41	7.46	7.51	7.58	7.65	7.75	7.88	8.09

Probit regression according to EP17-A2


P_r, kPa
P_{so}, kPa
$i_r/W^{1/3}$, kPa-ms/kg$^{1/3}$
$i_s/W^{1/3}$, kPa-ms/kg$^{1/3}$
$t_a/W^{1/3}$, ms/kg$^{1/3}$
$t_o/W^{1/3}$, ms/kg$^{1/3}$
U, m/ms
$L_w/W^{1/3}$, m/kg$^{1/3}$
1000000
500000
300000
200000
100000
50000
30000
20000
10000
5000
3000
2000
1000
500
300
200
100
50
30
20
10
5
3
2
1
0.5
0.3
0.2
0.1
0.05
0.03
0.02
0.01
0.005
0.05 0.07 0.1 0.2 0.3 0.5 0.7 1 2 3 4 5 6 7 8 10 20 30 40 50
Scaled Distance Z = R/W$^{1/3}$