Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Supplementary Examination, July 2020

Program: B.Tech, Fire & Safety Engineering
Semester: VI
Course: Chemical Process Safety
Course Code: FSEG 312 **Max. Marks: 100**
No. of pages: 6

Instructions
All questions are compulsory
All questions are choice based
All questions carry equal marks

1. Which of the following is not a potential line of defence-
   (A) containment dyke (B) sprinkler systems (C) centrifugal pump (D) alarm
2. Some of the safety elements that can be included on the flow sheets are:-
   (A) Inventory (B) Boiling point (C) freezing point (D) Molecular weight
3. The material & energy balance are also included on the process flow diagram-
   (A) True (B) False
4. An important material characteristic requiring attention in early stages of process design is - (A) Boiling point (B) freezing point (C) Flammability (D) Vapour pressure
5. Toxic release under favourable condition is normally regarded as having a disaster potential greater than the explosion - (A) True (B) False
6. Low pressure & temperature creates stresses that must be accommodated by design in process condition- (A) Ture (B) False
7. Which of the following process condition is likely to be most problematic?-
   (A) High pressure (B) Low temperature (C) Combination of high temperature and pressure (D) High temperature
8. Which of the following are more susceptible to crumble at low temperature?-
   (A) mild steel (B) Stainless steel (C) Both (D) None of these
9. Which of the following was not a part of the failure in the line of defence in the Bhopal gas tragedy?-
   (A) Relief valve header (B) Refrigeration system (C) Alarm system (D) Flare tower
10. Plant siting is done by taking into consideration-
    (A) Means of effluent (B) Labour (C) Transportation (D) All of the above
11. Which of the following would not cause injury to the neighbours of a process plant –
    (A) Explosion (B) Transportation (C) Lethal dose (D) Fire
12. Site must be evaluated for potential risks to human populations factors to be evaluated include- (A) Credible worst case (B) Weather extremes (C) Stable power supply (D) Pollution & waste disposal

13. The arrangement of process units & buildings are crucial factors in -
    (A) Economics of plant (B) Safety of plant (C) None of these (D) Both safety and economics of plant
14. The prevention of accidents through the use of appropriate technologies to identify the hazards of a chemical plants & eliminate them before an accident occurs -
    (A) Risk (B) Safety or loss prevention (C) Site selection (D) Site evaluation
15. A chemical or physical condition that has a potential to cause damage to people property on the environment-
    (A) Risk (B) Hazard (C) Less prevention (D) Less time Injury
16. A measure of human injury environmental damage, or economic loss in terms of both the incident likelihood & the magnitude of the loss or injury called-
    (A) Risk (B) Hazard (C) All of these (D) Safety
17. Which of these eliminates the existing hazards as they are identified -
    (A) A good safety program (B) An outstanding program (C) A reasonable safety program (D) A bad safety program
18. Which of these prevent the existence of a hazard at the outset-
    (A) A bad safety program (B) A reasonable safety program (C) An outstanding program (D) A good safety program
19. Strategies for designing inherently safer processes are-
    (A) Amplification (B) Attenuation (C) Modify (D) None of these
20. Safer Material issued in place of hazardous material is an example of-
    (A) Minimization (B) Moderation (C) substitution (D) Simplification
21. Using a hazardous material under less hazardous conditions comes under-
    (A) Moderate (B) Simplify (C) substitute (D) Minimize
22. When possible hazardous material are produced & consumed insitu then it is called-
    (A) Minimization (B) Substitution (C) Simplification (D) Moderation
23. Eliminating unnecessary complexity is a part of-
    (A) Moderate (B) Substitute (C) Minimize (D) Simplify
24. A safety measure to eliminate or greatly reduce the hazard by changing the process or material to use materials & conditions which are non hazardous or much less hazardous is called - (A) Passive (B) Inherent (C) Active (D) Procedural
25. The general process hazards might arise due to several factors like-
    (A) Exothermic chemical reaction (B) Endothermic reaction (C) Limited access for emergency equipment (D) All of these
26. Which of the following is not an example of a special process hazard?-
    (A) Dust explosion risk (B) Corrosion and erosion of process unit (C) Improper drainage (D) air leakage due to low pressure process
27. Which kind of process allows for carbon steel vessels to loose its ductility?-
    (A) Low temperature process (B) High temperature processes (C) Low pressure processes (D) All of the above

28. Greater loss is expected when inventory is -
    (A) Less (B) independent of size of inventory (C) large (D)
29. Common failure models for pressure and compressors include-
    (A) Seal leaks (B) casing failure (C) stopping (D) All of the above
30. The selection of pump & seal type is usually dependent on.-
    (A) Shafts (B) Motors (C) Fan (D) Process considerations
31. Liquid entry into which of these can cause catastrophic failure -
    (A) Compressors (B) pumps (C) Both of these (D) none of these
32. Typical mechanical separator equipment include-
    (A) Centrifuges (B) Distillation column (C) Thermal oxidizers (D) Incinerators
33. Common failure modes for centrifuges include-
    (A) Agitation failure (B) Cooling system failure (C) Over speeding (D) Steam generation
34. A concern for filters is exposure or loss of containment during opening & closing -
    (A) Ture (B) False (C) (D)
35. Common failure modes for dust collectors include-
    (A) Vibration (B) Loss of grounding of filter bags (C) Wrong reactant charged (D) Leaking seals
36. A pyramid shaped container used in industrial processes to hold particulate matter that has been collected from expelled air called -
    (A) Hopper (B) Dust collector (C) Filter (D) Centrifuges
37. Which is not a common failure modes for reactors -
    (A) Mechanical friction from bearings (B) Static electricity (C) Loss of cooling (D) Agitation failure
38. Fired equipment are commonly used to provide heat to processes -
    (A) Ture (B) False
39. Fire & explosions in flairs can be caused due to- (A) Liquid carry over (B) Scrubber failure (C) Relief system failure (D) Blowdown drum failure
40. As the reactor size is decreased the surface area to volume ratio - (A) decreases (B) increases (C) remains unchanged (D)
41. The separation process involving two immiscible liquids is called- (A) Adsorption (B) Extraction (C) Distillation (D) Stripping
42. The spontaneous and sudden movement of a large mass of liquid from the bottom to the top surface of a storage reservoir due to the instability caused by an adverse density gradient is called?- (A) Boilover (B) Rollover (C) Slopover (D) Spillover
43. Tanks used to store solids are called- (A) Barrel (B) Silos (C) Hoppers (D) All the three
44. The root cause of the explosions in the Buncefield disaster which occurred in 2005 was ?- (A) Runaway reaction (B) Overpressurization (C) Overfilling (D) Vacuum collapse
45. Floating roof tanks are suitable for storage of materials having- (A) Low vapour pressure (B) High vapour pressure (C) High boiling point (D) None of these

46. A tank is to be chosen for the storage of ammonia, which of the following would you choose?- (A) atmospheric storage tanks (B) Pressurised storage tanks (C) Both of these (D) None of these
47. A pressure vessel designed for 500 psi will be expected to fail at ?- (A) 500 psi (B) 2000 psi (C) 1000 psi (D) 1500 psi
48. Earth covered above ground storage tanks are called as?- (A) Bullet tanks (B) Atmospheric storage tanks (C) Pressurized storage tanks (D) Mounded tanks
49. An internal floating roof tank is less susceptible to failure due to - (A) lightening strikes (B) Overfilling (C) Mechanical failure (D) Overpressurization
50. Identify which system does not come in the category of line of defence- (A) containment dyke (B) sprinkler systems (C) centrifugal pump (D) alarm
51. Another name for a knockout drum is- (A) blowdown drum (B) blowdown drum and catch tanks (C) catch tanks (D) None of these
52. What is the pressure difference between the relief set pressure and the relief reseating pressure called?- (A) blowout (B) blowthrough (C) blowdown (D) backpressure
53. Name which device among the following is most appropriate for installing for pressure relief on a liquified chlorine storage tank.- (A) rupture pin device (B) spring operated pressure relief valve (C) globe valve (D) none of these
54. To avoid chatter in spring relief devices, the percentage of maximum flow capacity should be?- (A) 10 to 15 (B) 15 to 20 (C) 20 to 25 (D) 25 to 30
55. What is the ratio of maximum absolute discharge pressure to the relief valve set pressure for gas discharge through an unfired pressure vessel relief valve?- (A) 1.2 (B) 1.3 (C) 1.1 (D) 1.4
56. What is the best location to place scrubbers for safe disposal?- (A) after flares (B) before blowdown drums (C) after incinerators (D) after blowdown drums
57. Flares used to retain liquids released with gases are called flare pits- (A) True (B) False
58. In a fire triangle , which of these is not a part of it ?- (A) spark (B) hot surface (C) Argon (D) propane
59. For vessels what is the most common inerting procedure ?- (A) pressure purging (B) sweep-through purging (C) Vacuum purging (D) siphon purging
60. For vessels not rated for pressure or vacuum the purging technique to be used is :- (A) siphon purging (B) sweep-through purging (C) combined pressure-vacuum purging (D) vacuum and pressure purging with impure nitrogen
61. The incorrect statement among the following is ?- (A) In some cases both pressure and vacuum are used simultaneously to purge a vessel (B) Pressurization process is much more rapid compared to the development of vacuum (C) Pressure purging uses more inert gas (D) None of the above
62. The use of flammability diagram is to identify - (A) Flammable region (B) fuel-rich region (C) oxygen-rich zone (D) inert gas-rich zone
63. On which of these interfaces Double-layer charging cannot occur - (A) solid-liquid (B) gas-liquid (C) gas-solid (D) liquid-liquid
64. What is the breakdown voltage of air ?- (A) 3 MV/m (B) 3 kV/m (C) 30 kV/m (D) 30 MV/m

65. What is the discharge between two metallic objects called- (A) corona discharge (B) spark (C) brush discharge (D) Conical pile
66. In order to prevent ignition one has to- (A) maintain the fuel below LFL and above UFL (B) maintain the fuel above LFL and below the UFL (C) maintain the fuel below UFL (D) maintaing the fuel above LFL
67. In order to prevent electrostatic discharges we need to include- (A) grounding (B) bonding (C) keeping non-conductive surfaces thin enough (D) all of the above
68. How should the vessel be kept to prevent lightening like discharges- (A) keep vessel volume above 60 m3 (B) keep vessel volume below 60 m3 (C) keep vessel diameter more than 3 m (D) keep vessel diameter less than 60 m
69. Which of the following is not a containment system- (A) Scrubber (B) Flare (C) Condenser (D) Centrifuge
70. The effect of backpressure on the relief valve can be felt in terms of changes in- (A) Set pressure (B) Capacity (C) Both (D) None of these
71. In pressure relief terminology, overpressure is a- (A) valve characteristic (B) Vessel characteristic (C) process characteristic (D) All of the above
72. For a vessels equipped with a single pressure relief device having MAWP of 20KPa, the relieving pressure should be- (A) 24kPa (B) 22kPa (C) 18kPa (D) 23.8kPa
73. Overpressure is equivalent to the accumulation when the set pressure is below the MAWP- (A) True (B) False
74. Which of the following is not expressed as a percentage of another pressure variable- (A) Overpressure (B) Backpressure (C) blowdown (D) Accumulation
75. The limiting oxygen concentration for most combustible gaseous mixtures is - (A) 0.08 (B) 0.2 (C) 0.1 (D) 0.05
76. For low cost inerting applications which will be more suitable- (A) Vacuum purging (B) Pressure purging (C) All of these (D) sweep-through purging
77. During inerting operation a 100 gallon vessel was purged with 380 litre of nitrogen gas, which form of purging was used- (A) vacuum purging (B) Pressure purging (C) sweep-through purging (D) siphon purging
78. In charging by transport the transferred charge is a function of - (A) conductivity of droplet (B) conductivity of interface (C) capacitance of object (D) All of these
79. A Nonconductive coating with thickness 4 mm and breakdown voltage 2 kV is susceptible to- (A) spark discharge (B) propagating brush discharge (C) Brush discharge (D) None of these
80. Which of the following elements react less violently with water - (A) Potassium (B) Sodium (C) Magnesium (D) lithium
81. There is nearly always a fire hazard with inorganic reactions- (A) True (B) False
82. A reaction gives out heat measured as 723J/gram, it is categorised as - (A) Moderately exothermic (B) Mildly exothermic (C) Strongly exothermic (D) Extremely exothermic
83. Which of the following is a reducing agent?- (A) Chlorine (B) hydrogen peroxide (C) sulphur dioxide (D) nitric acid
84. A reaction can pose as a significant hazard if it leads to a rise in temperature of - (A) 100 degree C (B) 200 degree C (C) 300 degree C (D) 150 degree C

85. Most of the more powerful inorganic reactions come under the headings of- (A) oxidation-reduction reactions (B) acid-base reactions (C) hydrations and hydrolyses (D) All of these
86. To heat up a toxic fluid in a shell and tube type heat exchanger it must be placed in the shell side- (A) True (B) False
87. Which of the following tends to occurs in a heat exchanger?- (A) Crystallization (B) High temperature hydrogen attack (C) embrittlement (D) All of these
88. What is the design consideration to be followed to ensure adequate heat transfer in heat exchangers- (A) Ability to clean (B) Presence of alarms (C) Both (D) None of these
89. An example of a pyrophoric substance is - (A) Potassium permanganate (B) sodium chloride (C) iron sulphide (D) Hydrogen sulphide
90. Two phase flashing releases can be expected to occur from leaks in- (A) A natural gas pipeline (B) Vessel containing dust (C) Relief valve of a pressure liquified gas container (D) Hexane storage tank
91. Which of the following cannot be considered as a line source of emissions- (A) A highway (B) A landfill (C) A row of industries equipped with stacks (D) Burning of agricultural waste along the edge of large fields
92. The effective stack height is- (A) Stack height +plume rise (B) Sum of stack height – plume rise (C) Stack diameter + plume rise (D) Stack diameter - plume rise
93. For which of the following conditions the Gaussian plume model is applicable, when all other conditions are met- (A) Wind speed changing with distance downwind of point of emission (B) Pollutant is particulate in nature (C) Pollutant has the same density as air (D) The weather is constantly changing
94. When the source is a landfill, the effective stack height "H" is taken to be- (A) 0 (B) Height of the landfill above sea level (C) Height of the landfill boundary (D) Height of inversion
95. The description "A fall afternoon, or a cloudy summer day, or clear summer day with the sun 15-35° above the horizon" corresponds to which category of day solar insolation- (A) Strong (B) Moderate (C) Slight (D) Poor
96. For overcast conditions the applicable stability criteria is- (A) A (B) B (C) C (D) D
97. For stability Class C, the lateral dispersion coefficient at 2 km distance from source is- (A) 114.70 m (B) 193.27 m (C) 92929.62 m (D) 62025.2 m
98. For stability Class A, the vertical dispersion coefficient at 2 km distance from source is- (A) 395.82 m (B) 395.82 km (C) 1953 km (D) 1953 m
99. Wind speed measured at 10 m height is 5 m/s. What is the wind speed at 100 m height expected to be if Stability Class B prevails?- (A) 12.6 m/s (B) 7.92 m/s (C) 7.06 m/s (D) 8.89 m/s
100. Gases commonly used for inerting - (A) nitrogen (B) carbon dioxide (C) Steam (D) All of the above