

[Time: 3 Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question No.1 is compulsory.
  2. Attempt any **Three** out of remaining questions.
  3. Assume any suitable data if necessary and indicate it clearly.
  4. Draw neat sketches wherever required.

1. a) Explain equivalent evaporation and boiler efficiency. **05**
- b) Explain distribution of compressed air in a process plant with diagram. **05**
- c) Explain Flammability limits. **05**
- d) Give different statistical methods available to characterize accident and loss performance. **05**
2. a) A process has reported FAR of 2. If an employee works a standard 8-hr shift 300 days per year, compute the deaths per person per year. **10**
- b) Explain Detonation and Deflagration. **10**
3. a) Give classification of boilers. **10**
- b) A reactor contains the equivalent of 10,000 lb of TNT. If it explodes, estimate the injury to people and the damage to structures 500 ft away.  
Data:-  
for  $z_e = 9.20 \text{ m/kg}^{1/3}$ , Scaled overpressure = 0.21  
for deaths resulting from lung hemorrhage,  $Y = -77.1 + 6.91 \ln P$   
for ear drum rupture,  $Y = -15.6 + 1.93 \ln P$  **10**
4. a) Derive the equation of COP for reversed Carnot cycle. **10**
- b) Set up an analysis of variance table by direct method for three varieties of wheat, each grown on 4 plots and state if the variety differences are Significant. **10**

Plot of land	Per acre production data		
	Variety of wheat		
	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

Turn Over

5. a) Explain Vapor absorption cycle. **10**
- b) A room is used for dispensing flammable liquids. The liquids are expected to have fundamental burning velocities less than 1.3 times that of propane. The room is 9 m long by 6 m wide by 6 m in height. Three of the walls are shared with an adjoining structure. The fourth and larger wall of the room is on the outer surface of the structure. The three inside walls are capable of withstanding a pressure of 0.05 bar. Estimate the vent area required for this operation. **10**
6. a) Explain major advantages and disadvantages of spring operated relief valve and rupture disc. **10**
- b) Give various applications of air in chemical plant. **10**
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