2012-2013
B.TECH. (WINTER SEMESTER) EXAMINATION
PETROCHEMICAL ENGINEERING
PLANT SAFETY AND POLLUTION CONTROL
PK-421N

Maximum Marks: 60  Credits: 04  Duration: Three Hours

Answer all the questions.

Q.No.  Question  M.M. 60
1(a) Discuss in detail industrial safety with emphasis on employer’s and employee’s responsibility towards safety? [7]
1(b) Discuss the major hazards associated with process industries? [8]

OR

1’(a) Discuss in detail the four essential principles of safety? [7]
1’(b) Briefly discuss safety and loss prevention approaches such as Total Loss Control and quality assurance? [4]
1’(c) Distinguish between:
   (i) Acute effect and chronic effect [4]
   (ii) Deflagration and detonation
   (iii) Unconfined vapor cloud explosion and BLEVE
   (iv) LD₅₀ and TLV

2(a) What is material safety data sheet? What are the important information that the MSDS convey? [5]
2(b) Discuss the classification of fire? [2]
2(c) What is a work permit? Discuss in brief the types of work permit? What is the general procedure of issuing a work permit? [5]
2(d) What steps should be incorporated in a response program towards an emergency? [3]
3(a) What is HAZOP? What are the steps that have to be taken during HAZOP analysis? [7]
3(b) Air contains 8 ppm of diethylamine (TLV-TWA of 10 ppm), 27 ppm of cyclohexanol (TLV-TWA of 50 ppm), and 17 ppm of propylene oxide (TLV-
TWA of 20 ppm). What is the mixture TLV-TWA and has this level been exceeded?

3(c) Discuss any one of the major hazard event that had occurred in the past? Also list out the safety procedures were overlooked which resulted in the hazard event?

4(a) Draw the atmospheric stability diagram for super-adiabatic, inversion, neutral and inversion over super-adiabatic conditions along with their plume behavior?

4(b) A power plant has a stack with a diameter of 2 m and emits gases at 1.1 kg/min with a stack exit velocity of 15 m/s and a heat emission rate of 4,800 KJ/sec. The wind speed is 13 m/s. Conditions are super-adiabatic (class C). Estimate the plume rise. If the stack has a geometric height of 50 m, what is the effective stack height? Also what will be the ground level concentration 800 m directly downwind from the stack?

4(c) Discuss in detail Activated Sludge process with the help of neat sketch? Why the sludge in this process is called as activated sludge?

OR

4'(c) Discuss aerobic and anaerobic sludge stabilization process? The BOD$_2$ from a primary clarifier is 120mg/lit at a flow rate of 0.05 million gallon per day. The dimension of aeration tank is 20*10*20 ft$^3$ and MLSS is 2000 mg/lit. Calculate the F/M ratio?
Figure 1. Standard deviation or dispersion coefficient, $\sigma_y$, in the crosswind direction as a function of downwind distance.

Figure 2. Standard deviation or dispersion coefficient, $\sigma_x$, in the crosswind direction as a function of downwind distance.
2012-2013
B.TECH. (WINTER SEMESTER) EXAMINATION
PETROCHEMICAL ENGINEERING
PROCESS UTILITIES AND ENERGY MANAGEMENT
PK-422N

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.

Q.No.  Question  M.M. 60


1(b)  Discuss in detail External Chemical Treatment methods for Boiler feed water? Also mention the residual hardness of the feed water for each treatment method?  [8]

OR

1'(b)  (i) Explain with the help of T-S diagram the effect of increase and decrease in pressure on the properties of steam (enthalpy of vaporization and sensible heat)? Also explain dryness fraction and wetness fraction using T-S diagram.  [8]

(ii) Differentiate steam on the basis of their temperature and pressure. Also mention their area of application?

1(c)  Discuss classification of refrigerant on the basis of toxicity and flammability? Write the chemical formula of R134, R22, R718.  [3]

2(a)  What is the importance of Condensate recovery?  [4]

2(b)  Write a note on efficient utilization of steam.  [7]

Contd.......2
2(c) Maximum permissible limit of TDS in a boiler is about 3500 ppm and percentage make up water is 40 if TDS in feed water is 350 ppm, calculate the percentage blowdown.

2(d) What is steam trap? How steam trap differentiate between condensate and steam?

3(a) Write a note on effective Energy management.

3(b) What do you understand by Energy Audit? What are the objectives of energy audit?

3(c) Describe the energy conservation methodology practiced in process industry for equipments such as pumps, furnace and boilers.

4 Discuss the principle and working of (any 3):
   i. Heat pipe
   ii. Heat pump
   iii. Waste heat boiler
   iv. Air preheaters
   v. Bubbling fluid bed boiler
   vi. Circulating fluid bed boiler
2012-13
B.TECH. (WINTER SEMESTER) EXAMINATION
PETROCHEMICAL ENGINEERING
INDUSTRIAL INSTRUMENTATION
PK-427A

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  Question  M.M.
1(a)  Explain the construction and working of mechanical and electrical pressure sensing [7.5] elements with the help of neat sketch.

1(b)  Differentiate between;
     (i). Analog and Digital instrument [7.5]
     (ii). Null and Deflection type instruments.
     (iii). Monitoring and Transmitting instruments
     (iv). Active and Passive instruments.

OR

1'  You are supposed to do the automation task for a room cooler (water evaporation [15] based). The room cooler primarily contains a fan, water pump, and wet surface pads. The automation objective is to maintain the relative humidity (RH) of space in range of 60 – 80 %. Suggest the sensor. Draw the P&ID of room cooler.

2(a)  In a sugar industry the finished sugar is to be stored in vertical bin. What kind of [7.5] measurement problem related to level and weight do you expect and what step you will take to rectify it?

2(b)  What do you mean by primary and secondary variables? Give the name of few [7.5]

Contd......2
primary variables for which pressure may act as secondary variable. Explain the
construction and working of capacitive pressure transducer with the help of a neat
line diagram.

OR

2'(a) In a pharmaceutical plant the temperature control of reactor is very critical for the
quality of drugs. You have to choose the suitable temperature sensor among the
followings; justify your selection by comparing the inherent characteristics of each
of them.


2'(b) Draw the complete Process and Instrument Diagram (P&ID) for a fractionating
column. Also describe the control methodology.

3 Explain the need of A/D and D/A converters are required in modern instrumentation
techniques? Explain the physical significance of following terms; (i). Noise, (ii).

OR

3' Draw the P&ID for following control task that are needed for a reactor as shown in
figure;

a. Rate of catalyst feed to reactor.

b. Control of agitator.

4(a) Explain the following terms;

4(b) What do you mean by control valve sizing? Find out the expression for fluid
resistance.