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.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  Question  M.M.
1(a)  What is Process Safety? How it differs from Industrial safety. Discuss the responsibilities of employer and employees towards safety. [6]

OR

1(a')  What is Process Hazard Analysis (PHA)? Discuss the various points of PHA. [6]

1(b)  What is Hazard? Discuss various hazards in process industries. [5]

OR

1(b')  Discuss various classes of Fire. What is the meaning of arson and smouldering with reference to fire? [5]

1(c)  Explain the concept of the Loss Prevention, Total Loss Control and Quality Assurance. [4]

2(a)  What is Explosion? Discuss various types of explosion. [6]

2(b)  What is MSDS. Discuss the salient features of MSDS. [4]

OR

2(b')  What is Work Permit? Discuss various types of work permits and the procedure of issuing work permit. [4]

2(c)  Explain the concept of Occupational Health and Safety. [5]

3(a)  What is HAZOP? Discuss in detail the steps undertaken while performing HAZOP. [12]

OR

3(g)  Discuss a case study of any major industrial accidental event. [12]

3(b)  Discuss Response towards Emergencies for a worker and for an emergency team member. [3]

4(a)  List out various assumptions of Gaussian plume model. Write down the formulas for calculating concentration of both gaseous pollutants and particulate matters emitting from a plume. [3]

4(b)  Discuss vertical dispersion in the atmosphere, taking in reference the movement of air parcel, along with the types of turbulence in the atmosphere. [6]

4(c)  With the help of neat sketch discuss Activated sludge process along the types of aeration used. [6]
2013-14
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.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.                     Question                                          M.M.
1(a) What is meant by the term Process Utility? List out various process utilities used in process industries. Discuss fuel oil as utility along with its storage, handling and preparation.    [10]

OR

1(a') Discuss Internal and External Water Treatment Process.                            [10]
1(b) What is Refrigerant? Explain the working of vapour compressor cycle in a refrigeration process.                  [5]
2(a) Discuss effective generation and utilization of steam.                   [10]
2(b) Discuss type of steam on the basis of its pressure and its area of application. What is meant by degree of superheat, dryness fraction and wetness fraction?     [5]

OR

2(b') What are Steam Traps? Discuss various types of steam traps.                          [5]
3(a) Discuss the concept of Effective Energy Management.                      [10]

OR

3(a') What is Energy Audit? Discuss the procedure for performing Energy Audit.          [10]
3(b) Discuss energy conservation in various process equipments.              [5]
4(a) Write the working principle of any three of the following:
    i. Circulating Fluidized bed boiler
    ii. Bubbling bed boiler
    iii. Economiser
    iv. Waste heat exchanger
    v. Heat pipe

[15]
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  

1(a) Explain the construction and working with the help of neat sketch of the followings;  
(i) RTD  
(ii) DPT  
(iii) ATC type diaphragm actuator for direct acting control valve  
(iv) Flange type orifice plate.  

1(b) Differentiate between;  
(i) PFD and P&ID  
(ii) Sensor and Transducer

OR

1' You are supposed to automate the domestic electrical geyser. The electrical geyser primarily contains a heating element, water tank, inlet and outlet connections. The automation objective is to maintain the hot water temperature at 70 degC. Suggest the sensor, controller and FCE, keeping the market price of Rs. 5500/- into consideration. Also Draw the P&ID.

2(a) Describe the selection criteria and precautions that must be taken into account while installing a pressure transducer in a process line.
2(b) Explain the problem associated with measurement of level in case of solids stored in vertical bins? Also discuss the remedy for this.

OR

2'(a) A LPG bottling plant needs automation for filling stations. The prescribed quantity of LPG may be determined either by pressure of gas inside the cylinder or by measuring the overall weight of filled cylinder. Which method you will prefer over other? Draw the control loop for your selected option. Justify your selection.

2'(b) Draw the complete Process and Instrument Diagram (P&ID) for a shell and tube type heat exchanger. Also describe the control methodology.

3 Explain the difference between the inherent and installed characteristic of control valve. Also explain the difference between valve sizing and valve characterization in detail with the help of suitable examples.

OR

3' In a flow control loop flow is sensed by a venturi meter having cross sectional area of throat and upstream line as 2.5 and 10 cm$^2$. The differential pressure transducer (DPT) converts the pressure differential to electrical signal as per the calibration chart:

<table>
<thead>
<tr>
<th>Q (m$^3$/s)</th>
<th>0.0</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (mA)</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
</tr>
</tbody>
</table>

Find out the change in differential pressure across venturi for change in corresponding electrical current of 10 to 15 mA.

($\rho_{\text{water}}=1000 \text{ kg/m}^3$)

4(a) Explain the “fail open” and “fail close” mode of failure with the help of a suitable P&ID

4(b) Explain any three terms of the following: