AMPE02 PROCESS ENGINEERING CALCULATIONS

UNIT-1 METHODS OF EXPRESSING COMPOSITIONS OF MIXTURE AND SOLUTIONS

1.1 Wet and dry basis concept. Ideal and real gas laws- Gas constant- normal molal volume, calculations of pressure, volume and temperature using ideal gas law.
1.2 Gas mixtures- Use of partial pressure and pure component volume in gas calculations
1.3 Dissociating gases- applications of real gas relationships in gas calculation. Gas Reservoir calculation of gas in place by volumetric method.
1.4 Calculation of unit recovery from volumetric gas reservoirs.
1.5 Calculation of unit recovery from Gas Reservoir under water drive.

UNIT-2 CONCEPT OF MATERIAL BALANCE

2.1 Application of material balance to unit operations like distillation, evaporation, drying.
2.2 Material balance involving key components, material balance with chemical reaction,
2.3 Limiting and excess reactants
2.4 Degree of completion.
2.5 Application of material balance to various types of chemical reactions- recycle and by passing operations- concept of purge.
2.6 Material balance equations for dry gas reservoirs.
2.7 Material balance for solution- as drives reservoirs.

UNIT-3 CALCULATION OF ABSOLUTE HUMIDITY

3.1 Molal humidity, relative humidity and percentage humidity- Dew point
3.2 Use of humidity in condensation and drying
3.3 Wet and dry bulb temperatures,
3.4 Humidity chart, solving problems using humidity chart.
3.5 Calculation of orsat analysis of products of combustion of solid, liquid and gas fuels
3.6 Calculation of hydrogen to carbon ratio and percentage excess air from flue gas analysis,
3.7 Calculations of sulphur and sulphur compounds burning operations.

UNIT-4 HEAT CAPACITY OF SOLIDS, LIQUIDS, GASES

4.1 Mean heat capacity- calculation of sensible heat using heat capacity, Kopp's rule, and various types of latent heats.
4.2 Energy balances- enthalpy data including steam tables and psychrometric charts,
4.3 Heat capacity data, phase change, mixing, heat of solutions,
4.4 Enthalpy- concentration diagram, heats of formation.
4.5 Combustion and reaction.

UNIT-5 INTEGRATED MATERIAL AND ENERGY BALANCE EQUATION

5.1 Concept of unsteady state material and energy balances,
5.2 Problems on unsteady state material and energy balances.

5.3 Calculations of material balance of gas reservoir in different regions with variation in composition.

References Books:

1. Houghen O.A, Watson K.M. and Ragatz R.A, "Chemical Process Principles" Part I, CBS Publishers (1973).
2. Warren K.Lewis, Arthur.M, Radash & H.Clay Lewis, "Industrial Stoichiometry, Mc.Graw Hill Book Co., New York, 1995.
3. William C.Lyons, Gary J.Plisga "Standard Handbook of Petroleum and Natural Gas Engineering" Second Edition, Gulf publishing Co., New York 2005.