Course: Enhanced Oil Recovery   **Semester: VIII**
Program: B.Tech APE GAS   **Time 03 hrs.**
Course Code: PTEG 427   **Max. Marks: 100**

Instructions: All questions are Mandatory.

SECTION A: (6*5M=30 Marks)

Q 1)

1. Select the factors that are to be considered during water flooding
   a) Reservoir Geometry
   b) Oil Properties
   c) Rock Properties
   d) Natural Drive Mechanism
2. Cost of injection relates to which parameter
   a) productivity of producing well
   b) overall life of the reservoir
   c) cost of injection equipment
   d) Monetary Investment
3. Water injection should be initiated when the reservoir pressure reaches
   a) Volatile point
   b) bubble point
   c) Condensation point
   d) none of the above
4. Sum of producible oil and non producible oil is termed as
   a) Oil reserves
   b) Oil resources
   c) Oil in place
   d) none of the above
5. Level of uncertainity in reserve estimation is due to
   a) Reservoir type
   b) Available technology
   c) Fluid properties.

d) Reservoir energy source.

Q 2)

1. Level of uncertainity in reserve estimation is due to
   a) Reservoir type.
   b) Available technology.
   c) Fluid properties.
   d) Reservoir energy source.
2. Reason for low oil production is due to
   a) High K Value.
   b) Homogeneous Structure.
   c) High Pressure.
   d) High Viscosity
3. Location of wells are influenced by
   a) Fluid properties
   b) Reservoir geometry
   c) Reservoir Depth
   d) Rock Properties.
4. Mark the following statement **"Trapped gas saturation is inversely proportional to reduction in residual oil volume"** as True or False.
5. Mark the following statement **"Objective of selecting proper flooding pattern is to have optimum constant with the crude oil system"** as True or False.

Q 3)

1. Gas injection projects considers the following flooding pattern
   a) Irregular injection patterns
   b) Peripheral injection pattern
   c) Basal injection pattern
   d) Crestal injection pattern
2. Zone in which all the points of saturation are at same velocity
   a) Stabilized Zone
   b) Unstabilized zone
   c) Homogeneous zone
   d) Heterogeneous zone
3. Fraction of vertical section of the pay zone contacted by injection fluids gives
   a) Vertical sweep efficiency

b) Areal sweep efficiency

c) Displacement efficiency

d) None of the above.

4. Mark the following statement **"Fractional flow equation is applicable for miscible fluids"** as True or False.

5. Mark the following statement **" Higher injected water viscosity will result in reduction of fractional flow"** as True or False

Q 4)

1. Mark the following statement **"Sequence of 7 zones that act in forward combustion is Burned zone-combustion front-coke zone-vaporizing zone-undisturbed reservoir-condensing zone-oil bank zone"** as True or False.

2. Mark the following statement **"Wet combustion is termed as COFCWA"** as True or False.

3. Mark the following statement **"Flue gases contains mainly carbon monoxide and water vapor"** as True or False.

4. Efficiency of oxygen utilization depends on
   a) amount of CO produced
   b) amount of unused oxygen produced
   c) C/H ratio
   d) none of the above

5. Percentage of heat generated that can transfer ahead of combustion front
   a) 25%
   b) 30%
   c) 20%
   d) 40%

Q 5)

1. The optimum oil saturation range for the application of microbial enhanced oil recovery?
   a) 40-70%
   b) 30-60%
   c) 45-75%
   d) 45-70%

2. Areal continuity of the pay zone is also a prerequisite for a successful -------------- Project?
   a) Polymer Flooding.

b) Water Flooding.
c) In-Situ Combustion.
d) Microbial EOR.

3. The effective permeability of the swept zone is reduced depending on -------- -------------- and -------------- of the polymer.

4. Chemical flooding is performed to increase --------------------------?
   a) Mobility Ratio.
   b) Capillary Number.
   c) To increase residual oil saturation.
   d) All of the above

5. Displacement of oil at a pore scale is termed as
   a) Macro-scopic displacement.
   b) Micro scopic displacement.
   c) Over all displacement.
   d) All of the above.

Q 6)

1. Low API gravity of reservoir oil has
   a) Less Coke deposition.
   b) High air requirement.
   c) Low air requirement.
   d) None of the above.

2. Pay thickness for effective in-situ combustion should be in the range of.
   a) 10-100 ft.
   b) 5-50 ft.
   c) 20-100 ft.
   d) 10-50 ft.

3. Approximate temperature in Steam Zone of Forward Combustion?
   a) 200° F
   b) 300^0 F
   c) 400° F
   d) 550^0 F

4. Vertical sweep efficiency in IN SITU COMBUSTION PROCESS is
   a) High
   b) Low
   c) Depends on crude concentration.
   d) Depends on reservoir properties

5. Mark the following statement **"Efficiency of EOR = sweep effciency * displacement efficiency * recovery factor"** as True or False.

SECTION B: (5*10M = 50 Marks)

Q 1)

    a) "Plasma-Pulse technology is the newest technique used for minimizing the residual oil saturations of the reservoir" Support the statement, if you agree, and enlist the leading oil companies using this technique. (5M)

    b) Define the term "Mobility Ratio" in EOR and explain the extent of reservoir fluid total mobility of reservoir fluid contribution in polymer flooding? (5M)

Q 2)

    a) Describe the challenges of EOR in the current oil industry with special reference to the applicability of EOR techniques in India. (5M)

    b) Discuss the necessity of screening criteria for EOR Process. Also, enlist the properties used for screening criteria. (5M)

Q 3)

    a) Discuss the following features of surfactants that may find application in EOR (6M)

        i) Classification.
        ii) Characterization.

    b) Elaborate the use of surfactant in conjunction with polymers in surfactant flooding; also indicate the activities of surfactant & co-surfactant in the process? (4M)

Q 4)

    a) What is ASP flooding? What are the advantages of ASP flooding? Explain the mechanism. (6M)

    b) Discuss the potential applicability of water-soluble polymers in Oil Industry (4M)

Q 5)

a) List the advantages of MEOR and Discuss biosynthesis of EOR chemicals and reservoir suitability in context with MEOR. (7M)
b) Discuss the silent features of steam flooding on Oil bank formation and Screening Criteria. (3M)

(OR)

a) Illustrate various reservoir properties necessary for in-situ combustion techniques together with the quantitative description of forward combustion? (7M)
b) Select the main factors that govern the volume of air required for In-situ combustion? (3M)

SECTION C: (1* 20M = 20M)

Q 1)
a) Discuss the applicability of Water-Oil Relative Permeability vs Water Saturation curve in EOR Process? (10M)
b) Differentiate between primary, secondary and tertiary recovery phases of oil production and discuss the technological aspects of – water influx & water injection in context with quality/quantity of oil recovery? (10M)

(OR)

a) Evaluate the aspects of thermodynamic Miscibility of alcohol slug (between the oil and the water) and its applicability in EOR. (10M)
b) Discuss the applications of Nano Technology in EOR? (10M)