UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2020

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 = 30M)

Q 1)

1. What is the average recovery of OOIP by primary and secondary recovery methods?
   a) 25%
   b) 42%
   c) 33%
   d) 67%
2. Which of the following is the reason for low oil production
   a) High K value.
   b) Homogeneous structure.
   c) High Pressure.
   d) High viscosity.
3. Recovery efficiency from gas cap expansion is
   a) 5-30%
   b) 35-75%
   c) 25-80%
   d) 20-40%
4. For calculating the ultimate recovery which of the following factor is required
   a) Pore Volume.
   b) Oil in Place.
   c) Reservoir area.
   d) Recovery factor.
5. Effectiveness of displacing fluids in volumetric sense is termed as
   a) Macro scopic displacement efficiency.
   b) Micro scopic displacement
   c) Over all displacement.
   d) All of the above.

Q 2)

1. Mark the following statement **“High residual oil saturations are necessary for considering relative permeability's”** as True or False.
2. Mark the following statement **“Low oil production means more displacing fluid production”** as True or False.
3. Mark the following statement **“Ratio of total oil in place to producible oil is called recovery factor”** as True or False.
4. Mark the following statement **“90% cofidence in recovering the proven estimates is termed as p90”** as True or False.
5. Mark the following statement **“Efficency of EOR = sweep effciency * displacement efficiency * recovery factor”** as True or False.

Q 3)

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. Water injection should be initiated when the reservoir pressure reaches----------?
   a) Volatile Point.
   b) Bubble Point.
   c) Condensation Point.
   d) All of the above.
4. Level of uncertainty in reserve estimation is due to ----------?
   a) Reservoir type.
   b) Oil properties.
   c) Injected Gas properties.
   d) Oil and Water saturations.
5. Approximate temperature in Steam Zone of Forward Combustion?
   a) 200^{o} F
   b) 300^{0} F
   c) 400^{o} F
   d) 550^{0} F

Q 4)

1. Fractional area of the field that is invaded by an injected fluid is called as ----------?

2. The effective permeability of the swept zone is reduced depending on ---------- and ---------- of the polymer.
3. In surfactant flooding, ---------- efficiency is increased by reducing IFT?
4. Average permeability of a reservoir for performing surfactant flooding should be ----------?
5. 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.

Q 5)

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. Mark the following statement **"Coke deposited is measured in kg/cu. ft "** as True or False.
3. Mark the following statement **"Mobility ratio greater than one suggests that the water moves greater than oil"** as True or False.
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. Efficiency of oxygen utilization in In-Situ combustion depends on
   a) Amount of CO produced.
   b) Amount of O_2 produced.
   c) Amount of heat generated.
   d) None of the above.
2. Amount of heat recovered from the burned zone is required to determine length of
   a) Combustion Zone
   b) Steam Zone
   c) Condensing Zone
   d) Coke Zone.

3. Mark the following statement **"Flue gases contains mainly carbon monoxide and water Vapour "** as True or False.
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 **"Movement of combustion zone depends on coke depletion"** as True or False.

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

Q 1)

a) Define the term "Mobility Ratio" in EOR and explain the extent of reservoir fluid total mobility of reservoir fluid contribution in polymer flooding? (5M)
b) Discuss the necessity of screening criteria for EOR Process. Also, enlist the properties used for screening criteria. (5M)

Q 2)

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 3)

a) Appraise displacement mechanism in Alkaline Flooding. Also, compare the screening criteria of alkaline flooding and polymer flooding? (5M)
b) Discuss the potential applicability of water-soluble polymers in Oil Industry. (5M)

Q 4)

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)

Q 5)

a) Describe the process description of alcohol flooding together with its advantages and disadvantages? (7M)
b) Describe the challenges of EOR in the current oil industry with special reference to the applicability of EOR techniques in India. (3M)

(OR)

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)

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

Q 1)

a) 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)

b) Discuss miscible process in CO_2 gas injection? Also, describe the geological parameters affecting CO_2 as EOR. (10M)

(OR)

Q 1)

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)