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## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B. Tech. APE UP

Subject (Course): Reservoir Engineering-I

Course Code : PTEG 331

No. of page/s: 3

Semester – V

Max. Marks : 100

Duration : 3 Hrs.

### Instructions:

- Answers must carry the supporting material such as equations and diagrams
- Abbreviations used in the questions are standard and have their usual meaning
- Make appropriate assumptions where data is not supplied

### SECTION A

Answer all five questions. Each Question carries 4 Marks

5x4= 20 Marks

- Question 1** Define Tortuosity, Sweep Efficiency, Size of Gas Cap and Effective Porosity. (4 Marks)
- Question 2** Define Capillary Number, Gas Formation Volume Factor, Vapor Pressure Curve and Dual Porosity. (4 Marks)
- Question 3** Describe the Principle of Material Balance Equation (MBE). What are the Sources of Data for use in MBE? (4 Marks)
- Question 4** What are Assumptions and Limitations of Material Balance Equation?(4Marks)
- Question 5** Explain Productivity Index, Recovery Factor, Viscous Fingering and Mobility Ratio. (4Marks)

### SECTION B

Answer all five questions. Question No. 1 to 4 are compulsory. Answer any one question from Questions No.5. Each Question carries 8 Marks

5x8= 40 Marks

- Question 1** Explain Capillary Hysteresis with suitable figure. What are the applications of Capillary Pressure? (8 Marks)

**Question 2** What is Reserves? What are the Objective? Explain types of Reserves.

Given the following data of oil field, calculate the Initial Oil in Place.

Area = 25,650 acres

Net productive thickness = 54 ft.

Porosity = 15%

Average  $S_{wi}$  = 30%

$B_o$  at  $p_i$  = 1.42 bbl/STB

(8 Marks)

**Question 3** Explain Fluid gravity. Calculate the specific gravity and the API gravity of a crude oil system with a measured density of 58 lb/ft<sup>3</sup> at standard conditions.

(8 Marks)

**Question 4** Define Effective Permeability and Relative Permeability.

Estimate the permeability of an oil zone with a connate-water saturation and average porosity of 32% and 22%, respectively by using Timur and Morris and Biggs equations.

(8 Marks)

**Question 5** Define Drive Mechanism. What are the different types of Reservoir Energy Sources? Explain in detail each Drive Mechanism in detail with suitable Figure.

(8 Marks)

**OR**

**Question 5** Explain Bubble Point Pressure Correlations, Specific Gravity Correlations, Gas Solubility and Viscosity Correlations with suitable diagram?

(8 Marks)

### SECTION C

**Answer all two questions. Question No. 1 is compulsory. Answer any one question from Questions No.2. Each Question carries 20 Marks**

**2x20 = 40 Marks**

**Question 1** (20 Marks)

1-a What are the classifications of reservoir fluids? What is sampling? What are the different factors to be consider while selecting a sampling Method? (10 Marks)

1-b Explain Decline Curve Analysis What are the techniques of Decline Curve Analysis. Explain exponential decline curve analysis in detail with suitable example and figure.

A well has declined from 100 BOPD to 95 BOPD during a one-month period. Assuming exponential decline, predict the rate after 12 months. Also, predict the cumulative oil produced after one year. (10 Marks)

**Question 2****(20 Marks)**

- 2-a Define EOR. What are the benefits of Enhanced Oil Recovery processes? Define Types of EOR. Explain Thermal Recovery Methods in detail with suitable Figures and examples. (10 Marks)
- 2-b Explain MBE in Gas Reservoirs. Cumulative oil production for example reservoir was  $14.73 \times 10^6$  STB at the time when reservoir pressure was 1100 psig. What is the remaining reservoir Oil Volume at 1100 psig? (10 Marks)

**Data Given:**

$$N = 95.46 \times 10^6 \text{ [STB]}$$

$$B_o \text{ at 1100 psig} = 1.134 \text{ [RB/STB]}$$

**OR****Question 2****(20 Marks)**

- 2-a Define Fluid Saturations. Explain Mathematical Concept, Physical concept and critical Saturations of Fluid. (10 Marks)
- 2-b Calculate average oil and connate water saturation from the following measurements

Sample	$h_i$ , ft	$\phi$ , %	$S_o$ , %	$S_{wc}$ , %
1	1.2	11	74	26
2	1.6	14	75	25
3	1.4	16	80	20
4	2.2	12	77	23
5	2.2	15	79	21
6	1.2	11	76	24

**(10 Marks)**