Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Winter Semester: 2021 - 22

Course Code: PET2004

Course Name: Fundamentals of Reservoir Engineering

Program & Sem: B.Tech & IV Sem

Date: 26th April 2022

Time: 03.00PM to 04.00PM

Max Marks: 30

Weightage: 15%

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) Question Paper has THREE Parts, i.e. Part A, Part B, and Part C.

(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries two marks. (5Qx 2M= 10M)

1 What is heterogeneous system? Give two examples of the system. (C.O.No.1) [Comprehension]

2 Define Critical pressure and Critical temperature. (C.O.No.1) [Comprehension]

3 State the difference between Gas reservoir and Gas-condensate reservoir. (C.O.No.1) [Comprehension]

4 Write about different types of oil reservoirs. (C.O.No.1) [Comprehension]

5 Define Porosity. Write about the different types of porosity. (C.O.No.1) [Comprehension]

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries FIVE marks. (2Qx5M=10M)

6 As is true of all fluids, the specific gravity of oil varies according to the P & T. What is the name of the field unit of the gravity using in Petroleum Industry? Explain the utility condition of the gravity with a suitable equation to differentiate the crude oil types. (C.O.No.1) [Comprehension]

7 The tendency of a liquid to spread over the surface of a solid is an indication of the wetting characteristics of the liquid for the solid. What are the name of the characteristics? Explain the process with a neat diagram for a liquid-rock surface system. (C.O.No.1) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The question carries TEN marks. (1Qx10M=10M)

8 A proper averaging of saturation data requires that the saturation values be weighted by both the interval thickness in feet and interval porosity (%). How do you find the porosity and oil saturation for the given samples of the reservoir on an average? Also, show the value of water saturation from the given reservoir on an average.

Sample	h_i, ft	ϕ, %	S_o, %	S_{wc}, %
1	1.0	10	75	25
2	1.5	12	77	23
3	1.0	11	79	21
4	2.0	13	74	26
5	2.1	14	78	22
6	1.1	10	75	25

(C.O.No.1) [Comprehension]

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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

Winter Semester: 2021 - 22 | **TEST 2** | **Date**: 1st Juen 2022

Course Code: PET 2004 | **Time**: 03.00 PM to 04.00 PM

Course Name: Fundamentals of Petroleum Reservoir Engineering | **Max Marks**: 30

Program & Sem: B.Tech & IV | **Weightage**: 15%

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) Question Paper has THREE Parts, i.e. Part A, Part B, and Part C.

(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO marks. (5Qx 2M= 10M)

Q.NO.1 Define Capillary Pressure. How many types are available? (C.O.No.1) [Knowledge]

Q.NO.2 Permeability is _____ property of a porous medium. What is the SI unit? (C.O.No.1) [Knowledge]

Q.NO.3 The measured permeability at _____ saturation of a single phase is called the permeability of the rock. [2M](C.O.No.1) [Knowledge]

Q.NO.4 The permeability of a core sample measured by flowing air is always _____ than the permeability obtained when a _____ is the flowing fluid. [2M](C.O.No.1) [Knowledge]

Q.NO.5 What is the significance of negative sign in the compressibility equation? [2M](C.O.No.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries FIVE marks. (2Qx5M=10M)

Q.NO.6 Capillary Pressure is a function of adhesion tension and inversely proportional to the radius of the capillary tube. How the wetting characteristics behaves when the radius of the capillary tube decreases? Explain the behavior of capillary pressure considering saturation with a suitable diagram. [5M](C.O.No.1) [Comprehension]

Q.NO.7 Fluids are experience large changes in volume as a function of pressure. What is the name of the fluids? Explain the fluids with the help of an equation. Draw a diagram of different types of fluids using density parameter for the comparison purpose. [5M](C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. Each question carries ten marks. (1Qx10M=10M)

Q.NO.8 The permeability of a core plug is measured by air. The core plug is of 2 cm^2, length is 3 cm and provides differential pressure of 44.09 psi. The viscosity of the liquid is 0.018 cP. Only one measurement is made at a mean pressure of 2.152 psi. The air velocity has aligned to give a slope

of 70. The air permeability is 46.6 md. How will you determine the liquid permeability of the core sample and flow rate of the air passing through the core plug? [10M](C.O.No.1) [Comprehension]

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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021 - 22
Course Code: PET2004
Course Name: Fundamentals of Petroleum Reservoir Engineering
Program & Sem: B.Tech & IV

Date: 30th June 2022
Time: 09:30 AM to 12:30 PM
Max Marks: 100
Weightage: 50%

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO marks. (10Qx 2M=20M)

1. Define Phase. Write two properties of the Phase. (C.O.No.1) [Knowledge]

2. What are triple point and Sublimation? (C.O.No.1) [Knowledge]

3. Are Critical temperature and Cricondentherm same? State the reason. (C.O.No.1) [Knowledge]

4. Write about 3 different types of reservoirs. (C.O.No.1) [Knowledge]

5. Define Saturation. Write about the difference between Critical Oil Saturation and Residual Oil Saturation. (C.O.No.1) [Knowledge]

6. Each reservoir is composed of a unique combination of geometric form, geological rock properties, _____ and _____. (C.O.No.3) [Knowledge]

7. Define Material Balance equation. What is the use of the equation? (C.O.No.4) [Knowledge]

8. Write the two uses of Tank Model concept. (C.O.No.4) [Knowledge]

9. Material Balance equation uses _____ equals to _____ to explain the petroleum reservoir rock. (C.O.No.4) [Knowledge]

10. Write any two secondary recovery techniques for oil recovery. (C.O.No.3) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks. (3Qx10M=30M)

11. Each reservoir is composed of a unique combination of geometric form, geological rock properties, fluid characteristics, and primary drive mechanism. What is this drive mechanism? Why is it important to understand the hydrocarbon reservoir? What characteristics are generally study to understand this drive mechanism? (C.O.No.3) [Comprehension]

12. The equation that has long been recognized as one of the basic tools of reservoir engineers for interpreting and predicting reservoir performance. What is the name of this equation? Explain the equation with a tank model concept using suitable diagram. (C.O.No.4) [Comprehension]

13. The unsteady-state flow (frequently called transient flow) is defined as the fluid flowing condition at which the rate of change of pressure with respect to time at any position in the reservoir is not _____. How pseudosteady-state and unsteady state are different from each other? Explain these changes with suitable diagrams considering finite petroleum reservoir system.
(C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TEN marks. (5Qx10M=50M)

14. An oil reservoir of 640 acres and thickness is of 10 feet. The connate water saturation is of 20% and found to be of 18% effective porosity. The oil formation volume factor is 1.306 bbl/STB. How will you find out the initial oil in place (IOIP) for this reservoir? Also, determine the volume of oil from the reservoir at surface condition. (C.O.No. 1) [Application]

15. A hydrocarbon reservoir is characterized by five distinct formation segments that are connected in series. Each segment has the same formation thickness. How will you estimate the averaging permeability of the given reservoir under two different flow system? The radius, length and permeability of each section of the five bed reservoir are given below in Table 1 and 2:

Table 1 Radial flow system

Segment	r_i, ft
well bore	0.25
1	150
2	350
3	650
4	1150
5	1350

Table 2 Liner flow system

Length, ft	Permeability, md
150	80
200	50
300	30
500	20
200	10

(C.O.No.2) [Application]

16. A cylindrical having a radius of 10^{-4} cm which consists of Gas-Oil system. The density of oil is 0.7 g/cm3 and of gas is 0.000554 g/cm^3. The surface tension between two phases is 42 dynes/cm. The radius of the curvature formed by oil is $1.155x10^{-4}$ cm. How will you find the pressure difference between Gas-Oil system? Also, upto which height the oil will rise? (C.O.No.1) [Application]

17. Linear flow occurs when flow paths are parallel and the fluid flows in a single direction. How can you form the diffusivity equation considering the linearization of the linear flow system using suitable diagram? (C.O.No.2) [Application]

18. A linear porous media is flowing a 0.72 specific gravity gas at 120°F. The upstream and downstream pressures are 2100 psi and 1894.73 psi, respectively. The cross-sectional area is constant at 4500 ft^2. The total length is 2500 feet with an absolute permeability of 60 md. How the gas flow rate can be determined in scf/day (p_{sc} = 14.7 psia, T_{sc} = 520°R; z= 0.78, μ_g = 0.0173 cp). (C.O.No.2) [Application]