



**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING**

**MAKE UP EXAMINATION – JAN 2023**

**Course Code:** PET2004

**Course Name:** Fundamentals of Petroleum Reservoir Engineering

**Program** : B.Tech

**Date:** 30-JAN-2023

**Time:** 09:30 am to 12:30 pm

**Max Marks:** 100

**Weightage:** 50%

**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.**

**(10Qx 2M=20M)**

1. What is Phase? Draw a diagram of it. (C.O.No.1) [Knowledge]
2. What are Critical 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. Pore volume occupied by \_\_\_\_\_ and \_\_\_\_\_ in a reservoir simulated tank. (C.O.No.3) [Knowledge]
6. \_\_\_\_\_ system depicting petroleum reservoir helps to derive an \_\_\_\_\_ equation. (C.O.No.4) [Knowledge]
7. There are basically \_\_\_\_\_ driving mechanisms that provide the \_\_\_\_\_ necessary for oil recovery (C.O.No.3) [Knowledge]
8. Secondary recovery includes \_\_\_\_\_ and \_\_\_\_\_. (C.O.No.3) [Knowledge]
9. Pore volume occupied by the evolved solution gas is in \_\_\_\_\_ side of the tank model to show the \_\_\_\_\_ balance concept. (C.O.No.4) [Knowledge]
10. What is Material Balance equation? Why is it important? (C.O.No.4) [Knowledge]

### Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.

(3Qx10M=30M)

11. A reservoir is consist of a unique combination of geometric form, geological rock properties, fluid characteristics, and primary drive mechanism. Discuss the types of drive mechanism. Why is it worth for the hydrocarbon reservoir? What factors are required to understand this drive mechanism? (C.O.No.3) [Comprehension]
12. An equation which is one of the basic tools of reservoir engineers for interpreting and predicting reservoir performance. Write the equation. Explain the equation with a tank model using suitable diagram. (C.O.No.4) [Comprehension]
13. The shape of a reservoir has a significant effect on its flow behavior. For many engineering purposes, however, the actual flow geometry may be represented by one of the following flow geometries. What are the different flow geometry considered in petroleum reservoir engineering? Explain these different flow systems with suitable diagrams. (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. Calculate the initial oil in place (IOIP) for this reservoir. In addition, 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. Determine 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  $0.7 \text{ g/cm}^3$  and of gas is  $0.000554 \text{ g/cm}^3$ . The surface tension between two phases is 42 dynes/cm. The radius of the curvature formed by oil is  $1.155 \times 10^{-4}$  cm. Calculate the pressure difference between Gas-Oil system and height of the oil rise.

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

17. In the absence of severe reservoir heterogeneities, flow into or away from a wellbore will follow radial flow lines from a substantial distance from the wellbore. Derive the diffusivity equation considering the radial flow system using suitable diagram.

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

18. An oil well in the Nameless Field is producing at a stabilized rate of 600 STB/day at a stabilized bottom-hole flowing pressure of 1800 psi. Analysis of the pressure buildup test data indicates that the pay zone is characterized by a permeability of 120 md and a uniform thickness of 25ft. The well drains an area of approximately 40 acres. The following additional data is available:  $r_w = 0.25 \text{ ft}$ ,  $A = 40 \text{ acres}$ ,  $B_o = 1.25 \text{ bbl/STB}$ ,  $\mu_o = 2.5 \text{ cp}$ . Show the pressure profile (distribution) and list the pressure drop across 1 ft intervals from  $r_w$  to 1.25 ft, 4 to 5 ft, 19 to 20 ft, 99 to 100 ft, and 744 to 745 ft.

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