Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 13 – 12- 2025 **Time:** 09:30am – 12:30pm

School: SOE	**Program:** B.Tech. (PET)	
Course Code: PET1501	**Course Name:** Fundamental of Petroleum Engineering Calculations	
Semester: III	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**12**	**12**	**18**	**34**	**24**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Explain the relationship between API gravity and specific gravity and How is API gravity used to classify crude oils as light, medium, or heavy?	**2 Marks**	**L2**	**CO1**
2.	Summarize the concept of shrinkage in petroleum reservoirs.	**2 Marks**	**L2**	**CO2**
3.	Explain the concept of capillary hysteresis with a neat and clean diagram.	**2 Marks**	**L2**	**CO3**
4.	Describe the types of fluid with the help of plot in terms of dv/dp .	**2 Marks**	**L2**	**CO3**
5.	Explain the types of Flow Regimes in terms of dp/dt.	**2 Marks**	**L2**	**CO3**
6.	Summarize the types of fluid flow in terms of Reynold number.	**2 Marks**	**L2**	**CO3**
7.	Compare the open system and closed system in terms of mass and energy transfer.	**2 Marks**	**L2**	**CO4**
8.	Describe the Mechanical energy Conservation Law.	**2 Marks**	**L2**	**CO4**
9.	Explain the concept of Pseudoplastic non-Newtonian fluid.	**2 Marks**	**L2**	**CO5**
10.	Classify the types of Reservoirs in terms of bubble point pressure and critical temperature.	**2 Marks**	**L2**	**CO5**

Part B

Answer the Questions. **Total Marks 80M**

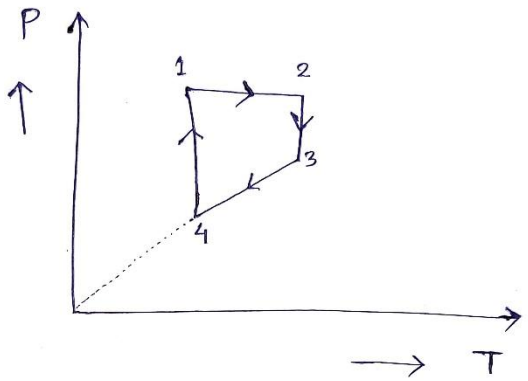
11.	**a.**	(i)Explain how petroleum engineers interpret measurements reported in both field units and SI units. Illustrate your answer with two examples where misinterpretation of these units could affect reservoir calculations. (ii) Demonstrate how you would calculate the bulk volume of an oil-bearing sand layer when given its areal extent and average thickness. Summarize why understanding the relationship among area, thickness, and volume is essential for estimating hydrocarbon in place.	**10 Marks**	**L2**	**CO1**
		Or			
12.	**a.**	(i)Explain the concept of API gravity and how it is interpreted to classify crude oils as light, medium, or heavy. Show how understanding this measure allows engineers to relate it to specific gravity for production planning. (ii) Review, using dimensional analysis, whether the equation v=g h is dimensionally consistent, where v is velocity, g is acceleration due to gravity, and h is height.	**10 Marks**	**L2**	**CO1**

13.	**a.**	Apply stoichiometric principles to the following problem: Propane (C_3H_8) is burned completely in oxygen according to the reaction. $C_3H_8 + O_2 \rightarrow CO_2 + H_20$ 1. Calculate the mass of oxygen (in grams) required to completely combust 44 g of propane. 2. Determine the mass of carbon dioxide produced. Show each step of your calculation and clearly state any mole ratios used.	**10 Marks**	**L3**	**CO2**
		Or			
14.	**a.**	Light oil with Specific gravity =0.82 and viscosity =12 cp flows at Q =0.006m^3/s through a pipe of diameter =50 mm. Determine the Flow regime. Determine the maximum flow rate for this fluid to have laminar flow	**10 Marks**	**L3**	**CO2**

15.	**a.**	Sketch a capillary pressure–saturation diagram showing both drainage and imbibition curves, clearly marking: (a) Irreducible water saturation, (b) residual oil saturation, (c) the hysteresis loop, (d) and the direction of each process (drainage vs. imbibition).	**10 Marks**	**L**	**CO3**
		Or			

16.	**a.**	A gas at p=2000 psi and temperature =200 ^{0}f Case 1: assume ideal behavior Case 2: take the compressibility factor (Z) =0.85 Predict the gas formation volume factor (B_g) for both the cases and determine the difference in the reserve estimation. Also illustrate with a plot that, how the compressibility factor (Z) varies with the pressure	**10 Marks**	**L3**	**CO3**

17.	**a.**	Explain the internal energy concept and compare the sensible energy and latent energy with all the terminologies used in their equations along with the examples from day-to-day life.	**10 Marks**	**L2**	**CO4**
		Or			
18.	**a.**	(i) A 3.00 kg object is dropped from rest from height 4.00 m. Neglect air resistance. What is its speed just before hitting the ground (ii) A mass attached with spring having stiffness K= 200 N/m is compressed 0.100 m. compute the velocity of the mass when the spring gets its original length.	**10 Marks**	**L2**	**CO4**

19.	**a.**	One mole of an ideal gas expands isothermally and reversibly at T= 300 K from volume V1 = 10 L to V2=20 L. Calculate the work done by the gas and the heat added.	**10 Marks**	**L3**	**CO4**
	b.	2 Kg of ice sample initially at -20°C is heated to stem at 110 ^{o}C use the data given below to determine the total heat required. C_{ice} = 2 KJ/Kg. ^{o}C, h_f =300KJ/Kg, C_{water} =4.18 KJ/Kg. ^{o}C, h_{fg} =2000KJ/Kg, C_{stem}= 2KJ/Kg, C_{water}=4.18 KJ/Kg. ^{o}C	**10Marks**	**L3**	**CO4**
		Or			
20.	**a.**	Interpret the P-V graph from the given P-T Graph  	**10 Marks**	**L3**	**CO4**
	b.	One mole of an ideal gas expands reversibly and isothermally from $V_1 = 2$ Lto $V_2 = 8$ Lat 300 K. Calculate ΔS. Use R= 8.314 J/mol.k. And determine, Can the ΔS of the Universe ever be negative.	**10Marks**	**L3**	**CO4**

21.	**a.**	Determine the working principle of sucker Rod pump with a clear flow chart.	**10 Marks**	**L3**	**CO5**
	b.	Choose the case where the capacity is maximum when the efficiency is 1. Case 1. Pump bore: 1.25 in Stroke length: 100 in Speed: 12 SPM Case 2. Pump bore: 1.75 in Stroke length: 80 in Speed: 10 SPM	**10 Marks**	**L3**	**CO5**
		Or			
22.	**a.**	Sketch the neat and clean two-phase diagram for the (i) Black oil reservoir. (ii) Low shrinkage oil reservoir. (iii) High shrinkage oil reservoir. And determine the API range and the color of oil in each type of reservoir.	**10 Marks**	**L3**	**CO5**
	b.	A sandstone Reservoir has a K=100md ,Thickness h=20ft ,Reservoir radius (r_e)=1000ft, well radius (r_w)= 0.33 ft , ΔP = 1500 psi, Viscosity = 2Cp , Bo=1.4rb/STB , Calculate the well flow rate.	**10 Marks**	**L3**	**CO5**