



PRESIDENCY UNIVERSITY

BENGALURU

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| Roll No. | | | | | | | | | | | | | | | |
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Mid - Term Examinations - MARCH 2026

Date: 11-03- 2026

Time: 09:30am - 11:00am

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|----------------------|---|----------------|
| School: SOE | Program: B.Tech. (PET) | |
| Course Code: PET1502 | Course Name: Basics of Petroleum Engineering Calculations | |
| Semester: II | Max Marks: 50 | Weightage: 25% |

| CO - Levels | C01 | C02 | C03 | C04 | C05 |
|-------------|-----|-----|-----|-----|-----|
| Marks | 10 | 30 | 10 | - | - |

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.

5Q x 2M=10M

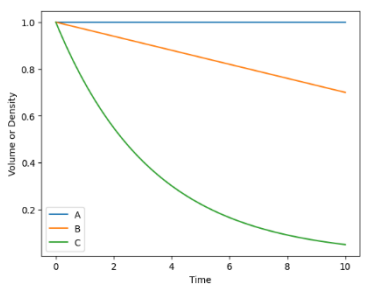
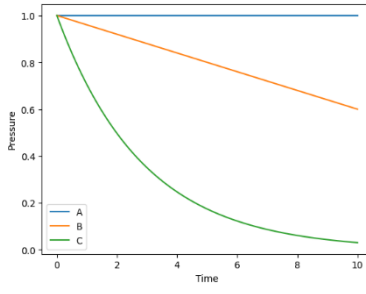
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|---|---|------------|----|-----|
| 1 | Review the "dimensionally consistency" of the relation $a=v/t$ using dimensional analysis, where v is velocity and t is time. | 2 Marks | L2 | C01 |
| 2 | State the connection between Celsius and Fahrenheit temperature scales and identify the Fahrenheit temperature that is equal to 5 °C. | 2 Marks | L1 | C01 |
| 3 | State what a higher API gravity value indicates about the density of crude oil compared to water. | 2 Marks | L1 | C01 |
| 4 | Compute the weight (in pounds) of 3 gallons of drilling mud if the hydrostatic pressure is 1500 psi at a wellbore depth of 1200 ft. | 2 Marks | L2 | C01 |
| 5 | Classify crude oil based on API gravity. Mention the ranges as well. | 2 Marks | L2 | C01 |

Part B

Answer the Questions.

Total Marks 40M

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| 6. | a. | A reservoir contains 180,000 bbl of oil in place. If the oil formation volume factor is 1.7 rb/stb, determine the expected stock-tank barrels recovered at surface. Illustrate the shrinkage concept in your solution and the relationship of B_0 with pressure. | 10 Marks | L3 | CO2 |
| | b. | A gas reservoir at 3,000 psia and 150 °F has a measured Z-factor of 0.85. Calculate the gas formation volume factor and compare it with the ideal-gas prediction, explaining the deviation. | 10 Marks | L3 | CO2 |
| Or | | | | | |
| 7. | a. | Calculate the mass of CO ₂ produced when 1 kg of pure methane is completely combusted, showing each stoichiometric step. (Combustion of methane reaction) | 10 Marks | L3 | CO2 |
| | b. | For a crude oil with specific gravity 0.85 and viscosity 15 cP, flowing at a rate of 0.008 m ³ /s through a pipe of 60 mm diameter, (a) Predict the flow regime using Reynolds number, and (b) Calculate the maximum flow rate at which the fluid will remain laminar. | 10 Marks | L3 | CO2 |

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| 8. | a. | <p>(i) Explain the types of fluids based on their flow behavior. Using Figure 1, categorize curves A, B, C into appropriate fluid types..</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Fig. 1</p> </div> <div style="text-align: center;">  <p>Fig.2</p> </div> </div> <p>(ii) Describe the different flow regimes in pipelines and indicate which flow regime A, B, C represents In Fig.2.</p> <p>(iii) State the conditions under which Darcy's law can be applied to calculate the volumetric flow rate and briefly explain why these conditions are necessary.</p> | 10 Marks [4+4+2] | L3 | CO3 |
| | b. | <p>An incompressible fluid is flowing through a linear porous rock formation. The formation has a length of 3000 ft, thickness of 12 ft, and width of 350 ft. The rock permeability is 120 mD, porosity is 18%, and the fluid viscosity is 1.8 cp. The pressure at the inlet is 3200 psi and at the outlet is 3185 psi.</p> <ol style="list-style-type: none"> 1. Calculate the volumetric flow rate of the fluid in bbl./day. 2. Determine the apparent fluid velocity in ft/day. | 10 Marks [4+3+3] | L3 | CO2 |

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|-----------|----|--|--------------------------------|-----------|------------|
| | | 3. Determine the actual fluid velocity in ft/day, considering porosity. | | | |
| Or | | | | | |
| 9. | a. | <p>From the given curve between capillary pressure and saturation analyze the drainage and imbibition processes and interpret</p> <ul style="list-style-type: none"> (i) Determine the displacement pressure from the curve. (ii) Identify the connate water saturation and explain its significance. (iii) Determine the Critical oil saturation. | 10 Marks [3+3+4] | L4 | CO3 |
| | b. | <ul style="list-style-type: none"> (i) Calculate the Flow rate of a sandstone reservoir having permeability (k)= 120md, thickness (h)= 15ft, reservoir radius (r_e)= 1500ft, well bore radius (r_w)= 0.4ft, change in pressure =1500 psi, viscosity =2 cp, $B_0=1.8$. (ii)The reservoir pressure at 8000 ft depth is 3500 Psi, Calculate <ul style="list-style-type: none"> (a) Pressure gradient. (b) Predict the pressure at 8000 ft depth if the drill mud used has a density of 9ppg | 10 Marks [5+5] | L3 | CO2 |