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**PRESIDENCY
UNIVERSITY**

BENGALURU

School of Engineering

Mid - Term Examinations - November 2024

Semester: VII

Date: 07-11-2024

Course Code: PET2016

Time: 09:30am – 11:00am

Course Name: Shale Gas

Max Marks: 50

Program: B.Tech

Weightage: 25%

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.

5QX2M=10M

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|---|--|---------|----|-----|
| 1 | Define shale as a reservoir. | 2 Marks | L1 | CO1 |
| 2 | Define anisotropy in the context of gas shales. | 2 Marks | L1 | CO1 |
| 3 | Identify characteristic of gas shale that distinguishes it from conventional reservoirs. | 2 Marks | L1 | CO2 |
| 4 | List the factors that contribute to wellbore instability in gas shale reservoirs. | 2 Marks | L1 | CO2 |
| 5 | Identify one way in which organic content influences shale gas potential. | 2 Marks | L1 | CO1 |

Part B

Answer ALL Questions. Each question carries 10 marks.

4QX10M=40M

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|----|---|---------|----|-----|
| 6a | Explain why shale exhibits different strength properties based on the direction of applied loads. | 5 Marks | L2 | CO2 |
| 6 | 6b Illustrate how the orientation of the wellbore influences the risk of slippage along bedding planes in shale formations. | 5 Marks | L2 | CO2 |

Or

7	7a	Illustrate the challenges arise from shale-drilling fluid interaction during drilling operations? Describe how this interaction can lead to pore pressure buildup and wellbore instability.	5 Marks	L2	C02
	7b	Elucidate limited information on the geo-mechanical properties of gas shale reservoirs. Explain how this gap affects drilling and reservoir management.	5 Marks	L2	C02
8	8a	Explain how properties like Young's modulus, Poisson's ratio, and unconfined compressive strength (UCS) help in determining the suitability of a shale reservoir for hydraulic fracturing.	5 Marks	L2	C02
	8b	If a wellbore is drilled at 30° to the bedding planes, what can be inferred about its stability, and mention the steps that can be taken to mitigate instability during the drilling operation based on the concepts discussed.	5 Marks	L2	C02
	Or				
9	9a	Why is brittleness important for shale reservoirs in hydraulic fracturing? Discuss how Young's modulus and Poisson's ratio help assess brittleness and suitability for fracturing.	5 Marks	L2	C01
	9b	Explain how shale composition, particularly the presence of illite, silts and smectite, influences its suitability for hydraulic fracturing.	5 Marks	L2	C01
10	10a	Describe the point load test method for measuring rock strength. How does it relate to the unconfined compressive strength (UCS) of the material?	5Marks	L2	C02
	10b	Illustrate the scratch test and how it is used to determine the unconfined compressive strength (UCS) of rocks. What are its advantages over traditional methods?	5Marks	L2	C02
	Or				
11	11a	Define the Thomsen parameters ϵ , γ , and δ . Discuss their significance in characterizing the anisotropy of VTI media.	5 Marks	L2	C02
	11b	Demonstrate key differences between marine shale and non-marine shale in terms of depositional environment and mineral composition.	5 Marks	L2	C02

12 Analyze how basin structure influences the accumulation of shale gas. Describe the geological features within a basin can affect the trapping of gas. **10 Marks L3 C01**

Or

13 Discuss how stratigraphic variations, such as changes in lithology and thickness, influence the reservoir quality of shale gas formations. Mention stratigraphic features that can enhance or diminish gas production potential. **10 Marks L3 C01**