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 **PRESIDENCY UNIVERSITY**

  **Bengaluru**

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| **End - Term Examinations – JANUARY 2025** |
| **Date:** 11 - 01- 2025 **Time:** 09:30 am – 12:30 pm |

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| **School:** SOE | **Program:** B. Tech in Petroleum Engineering  |
| **Course Code:** PET2016 | **Course Name:** Shale Gas (DE-X) |
| **Semester**: VII | **Max Marks**: 100 | **Weightage**: 50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **8** | **14** | **44** | **34** | **NA** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

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| **Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M** |
| **1** | List two factors contributing to wellbore instability in shale gas reservoirs. | **2 Marks** | **L1** | **CO2** |
| **2** | How does anisotropy influence gas flow in shale reservoirs?  | **2 Marks** | **L1** | **CO2** |
| **3** | Tell the significance of depositional environment in shale reservoir development. | **2 Marks** | **L1** | **CO1** |
| **4** | Recall the role of clay content play in the properties of shale reservoirs. | **2 Marks** | **L1** | **CO1** |
| **5** | Name two methods used to analyze the geochemistry of shale gas. | **2 Marks** | **L1** | **CO1** |
| **6** | Define stratigraphy deposition in shale gas exploration and its role in reservoir identification.  | **2 Marks** | **L1** | **CO1** |
| **7** | List the types of proppants used in hydraulic fracturing. | **2 Marks** | **L1** | **CO3** |
| **8** | Define petrophysics and mention its significance in shale gas exploration. | **2 Marks** | **L1** | **CO3** |
| **9** | Mention two measures to prevent groundwater contamination during shale gas extraction. | **2 Marks** | **L1** | **CO4** |
| **10** | Define induced seismicity and write its relevance to shale gas exploration. | **2 Marks** | **L1** | **CO4** |

**Part B**

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| **Answer the Questions Total 80 Marks** |
| **11.** | **a.** | Using the following data for a gas shale reservoir, calculate the anisotropy parameter ϵ:* C11=40×109 Pa
* C33=30×109 Pa

Interpret the significance of the obtained value of ϵ for wave propagation in shales. | **10****Marks** | **L2** | **CO2** |
| **or** |
| **12.** | **a.** | Discuss the anisotropy observed in shales as described by Thomsen (1986). Explain the causes of anisotropy in gas shale reservoirs. Write the expressions for Thomsen's anisotropy parameters (ϵ, γ, δ) and explain their significance in characterizing gas shale reservoirs and their applications in seismic analysis. | **10****Marks** | **L2** | **CO2** |
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| **13.** | **a.** | Discuss the methods used in geochemical exploration to assess the potential for hydrocarbon generation in source rocks. Include techniques such as vitrinite reflectance, rock-eval pyrolysis, and GCMS, and explain how each method helps determine the type and quality of hydrocarbons in the rock.  | **10****Marks** | **L3** | **CO3** |
| **or** |
| **14.** | **a.** | Discuss mini fracturing and its applications in shale gas reservoirs. Explain how does mini fracturing differ from traditional hydraulic fracturing in terms of pressure requirements, proppants, fracture propagation, and its effect on reservoir performance. | **10****Marks** | **L3** | **CO3** |

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| **15.** | **a.** | Illustrate the causes and consequences of induced seismicity during shale gas exploitation. Explain the measures that can be taken to mitigate its impact on surrounding communities. | **10****Marks** | **L3** | **CO4** |
| **Or** |
| **16.** | **a.** | Demonstrate the atmospheric emissions associated with shale gas production, focusing on methane leakage and fine particulate matter. Evaluate their impact on air quality and public health. | **10****Marks** | **L3** | **CO4** |

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| **17.** | **a.** | Discuss the environmental hazards associated with hydraulic fracturing, including induced earthquakes and groundwater contamination. Suggest mitigation strategies to address these hazards. | **15****Marks** | **L3** | **CO3** |
| **Or** |
| **18.** | **a.** | Discuss the process of hydraulic fracturing and its importance in shale gas production. Explain the key parameters involved, such as breakdown pressure, closure pressure, and fracture conductivity, and their role in optimizing the fracturing process | **15****Marks** | **L3** | **CO3** |

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| **19.** | **a.** | Examine the petrophysical properties of shale and their significance in hydrocarbon exploration. Discuss factors such as porosity (total and effective), permeability, mineral composition, organic content (TOC), gas content, and thermal maturity, highlighting their roles in determining reservoir quality and production potential. | **15****Marks** | **L4** | **CO3** |
| **Or** |
| **20.** | **a.** | Illustrate the techniques used for the assessment of petrophysical properties in shale reservoirs and discuss their applications in reservoir characterization, resource estimation, drilling optimization, and environmental studies. | **15****Marks** | **L3** | **CO3** |

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| **21.** | **a.** | Discuss the health and environmental hazards linked to shale gas exploitation. Evaluate the impact on water resources, including contamination and usage, and the effects of noise pollution and blowouts on local ecosystems and communities. | **20****Marks** | **L3** | **CO4** |
| **Or** |
| **22.** | **a.** | Interpret the environmental concerns associated with induced seismicity due to shale gas production. Discuss its causes, impacts, and mitigation strategies to minimize risks. | **20****Marks** | **L3** | **CO4** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***