| Roll No. | | | | | | | | | | | | |
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# PRESIDENCY UNIVERSITY

## BENGALURU

**End - Term Examinations –MAY 2025**

**Date:** 30-05-2025 **Time:** 01.00 pm – 04:00 pm

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

| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
|---|---|---|---|---|---|
| **Marks** | 06 | 08 | 44 | 42 | - |

**Instructions:**

*(i) Read all questions carefully and answer accordingly.*

*(ii) Do not write anything on the question paper other than Roll No. in the specified place only.*

## Part A

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

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| **1.** | Identify the correct answer:<br>_____ diagenetic process in shale is responsible for reducing porosity over time.<br>a) Compaction<br>b) Bioturbation<br>c) Erosion<br>d) Hydrothermal alteration | **2 Marks** | **L1** | **CO1** |
| **2.** | Identifythe correct answer:<br>_____ is the primary source of hydrocarbons in shale gas reservoirs.<br>a) Bitumen<br>b) Kerogen<br>c) Carbonate minerals<br>d) Sand grains | **2 Marks** | **L1** | **CO1** |
| **3.** | Name the right words and fill up the blanks:<br>Shale reservoirs are characterized by extremely low _____ and _____. | **2 Marks** | **L1** | **CO1** |
| **4.** | Select the correct answer:<br>_____ is a primary cause of wellbore instability in gas shale reservoirs.<br>a) High gas saturation<br>b) Changes in pore pressure | **2 Marks** | **L1** | **CO2** |

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| | c) Low organic content<br>d) Decreased temperature | | | |
| **5.** | Identify the statement Ture or False:<br>Wellbore instability in gas shales can be caused by changes in pore pressure and mechanical failure of the rock. | **2 Marks** | **L1** | **CO2** |
| **6.** | Define the importance of hydraulic fracturing in gas shale reservoirs. | **2 Marks** | **L1** | **CO2** |
| **7.** | Define the influence of bedding planes on shale anisotropy. | **2 Marks** | **L1** | **CO2** |
| **8.** | List the major factors that influence shale gas production. | **2 Marks** | **L1** | **CO3** |
| **9.** | Define the role of proppants in the hydraulic fracturing process. | **2 Marks** | **L1** | **CO3** |
| **10.** | List the various water management issues involved in shale gas production. | **2 Marks** | **L1** | **CO4** |

## Part B

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

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| **11.** | **a.** | Explain the relationship between TOC, kerogen type, and thermal maturity.<br>Describe how any of these three factors relates to the assessment of shale gas potential. | **10 Marks** | **L2** | **CO3** |
| | **b.** | Discuss the role of shallow seismic techniques and seismic data interpretation in the exploration and evaluation of shale gas reservoirs | **10 Marks** | **L2** | **CO3** |
| | | **Or** | | | |
| **12.** | **a.** | Describe the effects of hydraulic fracturing fluids on groundwater.<br>Predict the long-term consequences if not properly managed. | **10 Marks** | **L2** | **CO3** |
| | **b.** | Classify the different types of clay minerals found in shale formations. | **10 Marks** | **L2** | **CO3** |

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| **13.** | **a.** | Explain the causes, impacts, and preventive measures related to blowout events in shale gas production. | **10 Marks** | **L2** | **CO4** |
| | **b.** | Illustrate the guidelines and regulations necessary for sustainable shale gas exploration and exploitation. | **10 Marks** | **L2** | **CO4** |
| | | Or | | | |
| **14.** | **a.** | Classify the major environmental concerns associated with shale gas production.<br>Explain the impacts of major environmental concerns associated with shale gas production. | **10 Marks** | **L2** | **CO4** |
| | **b.** | Explain the main environmental impacts of methane emissions during shale gas production. | **10 Marks** | **L2** | **CO4** |

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| **15.** | **a.** | Solve a case study where a shale sample exhibits the following geochemical parameters:<br>TOC = 2.5%, S1 = 1.2 mg HC/g, S2 = 5.8 mg HC/g, S3 = 0.5 mg HC/g, $T_{max}$ = 440°C | **10 Marks** | **L3** | **CO3** |

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| | | Make use of this data to assess the hydrocarbon potential and maturity of the source rock. Also, identify what S1, S2, and S3 stand for and explain their significance in shale gas exploration. | | | |
| | **b.** | Apply gamma ray, porosity, and mineralogical analyses to develop an effective strategy for exploring and characterizing shale formations in natural gas extraction. | **10 Marks** | **L3** | **CO3** |
| **Or** | | | | | |
| **16.** | **a.** | Demonstrate your understanding of chemical usage in hydraulic fracturing by identifying commonly employed substances.<br>Illustrate the health hazards linked to any three chemicals.<br>Predict the potential consequences of long-term exposure to them. | **10 Marks** | **L3** | **CO3** |
| | **b.** | Demonstrate an effective and comprehensive water management strategy for a large-scale shale gas hydraulic fracturing operation, ensuring the protection of sensitive groundwater resources and vulnerable local ecosystems. | **10 Marks** | **L3** | **CO3** |

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| **17.** | **a.** | Illustrate the environmental and safety challenges caused by atmospheric emissions and noise pollution from shale gas production. | **10 Marks** | **L3** | **CO4** |
| | **b.** | Demonstrate the key air quality impacts of shale gas operations and explain how dual-fuel technology can be employed to reduce these environmental concerns. | **10 Marks** | **L3** | **CO4** |
| **Or** | | | | | |
| **18.** | **a.** | Apply your understanding to identify key social and environmental impacts of shale gas development on local communities.<br>Prepare effective strategies that can be developed to solve these issues and promote sustainable growth**.** | **10 Marks** | **L3** | **CO4** |
| | **b.** | Interpret the environmental risks associated with induced seismicity and shale gas operations.<br>Apply your understanding to demonstrate how practices such as site planning, emission control, and water management can be employed to solve these risks while ensuring safety for both human and ecological communities. | **10 Marks** | **L3** | **CO4** |