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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **End - Term Examinations – JANUARY 2025** |
| **Date:** 16 - 01 - 2025 **Time:** 09:30 AM – 12:30 PM |

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| **School:** SOE | **Program:** B.Tech. in Petroleum Engineering | |
| **Course Code:** PET2015 | **Course Name:** Coal Bed Methane | |
| **Semester**: V | **Max Marks**: 100 | **Weightage**: 50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **24** | **24** | **26** | **26** | **-** |

**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 2 marks. 10Q x 2M=20M** | | | | |
| **1** | Choose the Correct Answer:  \_\_\_\_\_\_\_\_\_\_ is the primary determinant of coal rank.  (a) Porosity  (b) Depth of Burial and Time  (c) Cleat Spacing  (d) Organic Content | **2 Marks** | **L1** | **CO1** |
| **2** | Recall a word to Fill in the Blank:  Coal rank is categorized into \_\_\_\_\_\_\_\_\_\_, bituminous, and \_\_\_\_\_\_\_\_\_\_. | **2 Marks** | **L1** | **CO1** |
| **3** | Define Enhanced CBM Recovery (ECBM). | **2 Marks** | **L1** | **CO2** |
| **4** | Choose the Correct Answer:  Enhanced CBM Recovery involves the injection of \_\_\_\_\_\_\_\_\_\_ gas to improve methane production.  (a) Carbon Dioxide (CO₂)  (b) Nitrogen (N₂)  (c) Helium (He)  (d) Oxygen (O₂) | **2 Marks** | **L1** | **CO2** |
| **5** | Choose the Correct Answer:  \_\_\_\_\_\_\_\_\_\_ is the primary purpose of hydraulic fracturing in CBM wells.  (a) To increase water content  (b) To enhance permeability and gas flow  (c) To decrease coal porosity  (d) To seal fractures in the coal seam | **2 Marks** | **L1** | **CO3** |
| **6** | Recall a word to Fill in the Blank:  Hydraulic fracturing enhances \_\_\_\_\_\_\_\_\_\_ in coal seams by creating \_\_\_\_\_\_\_\_\_\_ fractures. | **2 Marks** | **L1** | **CO3** |
| **7** | Label True or False:  (a) Hydraulic fracturing in CBM wells can improve gas flow by connecting natural fractures in coal.  (b) Directional drilling technology aids in accessing multiple coal seams from a single surface location. | **2 Marks** | **L1** | **CO3** |
| **8** | Choose the Correct Answer:  \_\_\_\_\_\_\_\_\_\_ reserve category is most certain in CBM projects.  (a) Possible Reserves  (b) Probable Reserves  (c) Proven Reserves  (d) Hypothetical Reserves | **2 Marks** | **L1** | **CO4** |
| **9** | Recall a word to Fill in the Blank:  CBM production in India primarily focuses on the \_\_\_\_\_\_\_\_\_\_ coal \_\_\_\_\_\_\_\_\_\_. | **2 Marks** | **L1** | **CO4** |
| **10** | List the significance of CBM in Gondwana coalfields. | **2 Marks** | **L1** | **CO4** |

**Part B**

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| **Answer the Questions. Total Marks 80** | | | | | |
| **11.** | **a.**  **b.** | Illustrate the figure showing relationship between Gas Content and Sorption Isotherm.    Explain the followings:  (i) Coal is a Source Rock and a Reservoir Rock.  (ii) Gas Storage Mechanism of Coal. | **20 Marks** | **L2** | **CO1** |
| **Or** | | | | | |
| **12.** | **a.**  **b.** | Explain the relationship between Apparent Density and Rank of Coal with a schematic diagram.  Illustrate the figure showing the relationship between Coal Rank and Cleat Frequency. | **20 Marks** | **L2** | **CO1** |
|  |  |  |  |  |  |
| **13.** | **a.**  **b.** | Identify the differences between Coal Bed Methane and Conventional Gas reservoirs based on the following characteristics.  (i) Transport Mechanism  (ii) Production Behavior  (ii) Mechanical Properties  Make use of the figure presented below to describe Langmuir isotherm. | **20 Marks** | **L3** | **CO2** |
| **Or** | | | | | |
| **14.** | **a.**  **b.** | Compute Matrix Gas Concentration (in Scf/ft3), when  Dry, Ash-free Langmuir Volume Constant (VL) = 537.22134 scf/ton,  Pressure in Fracture System (P) = 887.45326 psia,  Langmuir Pressure Constant (PL) = 0.89734 psia, and  Bulk Density (ρb) = 1.35 g/cm3.  Calculate Sorption Time (in days), when  Fracture Spacing (Sf) = 0.866512 ft, and  Diffusion Coefficient (D) = 0.045638 ft2/day. | **20 Marks** | **L3** | **CO2** |

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| **15.** | **a.**  **b.** | Outline casing considerations for vertical well construction.  Explain Open Hole Completions for a CBM Well. | **20**  **Marks** | **L2** | **CO3** |
| **Or** | | | | | |
| **16.** | **a.**  **b.** | Explain (i) fines, and (ii) frac fluids as a part of hydraulic fracturing considerations.  Discuss (i) surface logistics and strategic placement of the coal laterals, and (ii) underpressured coal beds as critical factors influencing surface CBM wells. | **20 Marks** | **L2** | **CO3** |

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| **17.** | **a.**  **b.** | Explain the Reserve Categories that developed by the Society of Petroleum Engineers.  Calculate Gas In Place (GIP), standard cubic feet, when A = 170 acres, h = 20 ft, ρ = 1821.97 tons per acre-foot, Gc = 435.23415 standard cubic feet per ton. | **20**  **Marks** | **L3** | **CO4** |
| **Or** | | | | | |
| **18.** | **a.**  **b.** | The given graph representing Historical production plot—DI-0431. Production data from Virginia Department of Mines and Minerals, Division of Gas and Oil, 2013.    Illustrate the Historical Production Plot—DI-0431.  Construct a predictive graph to forecast future production of CBM until 2017 by interpreting the Historical Production Plot. | **20**  **Marks** | **L3** | **CO4** |

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

**The students attempting Question No. 18 can do the analysis on the** **Historical Production Plot—DI-0431 presented below and enclose this page with the Answer Script.**

**No need to share the full Question Paper.**

