Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2020

Course: Coal Bed Methane Technology — **Semester: VII**
Program: B. Tech. APE UP — **Time 03 hrs.**
Course Code: PTEG 426/PEAU4009P — **Max. Marks: 100**

SECTION A

1. **Each Question will carry 5 Marks**
2. **Each Sub-Question consisting of MCQ, FIB, MA and TF will carry 1 Mark.**
3. **Instruction: Complete the statement / Select the correct answer(s)**

S. No.	Question	CO
Q 1	i) Organic matter is a key component in the ability to store methane in coalbed methane resources (CBM) a) True b) False ii) Which one does not define the coal characteristic a) Organic and inorganic composition b) Temperature & Pressure c) Burial History d) Geological age of coal iii) Which of the following statements is/are correct about the litho type Clarain? a) It is brighter than vitrain b) It is friable c) Contains small amounts of vitrinite but more inertinite and liptinite d) Both a and c iv) As volatile matter content of coal decreases, Methane generation a) Increases b) Remains constant c) Decreases v) The maximum V Ro% for hvAb rank of coal ranges from-------- a) 0.47 to 0.57 b) 0.57 to 0.71 c) 0.71 to 1.1 d) 1.1 to 1.5	**CO1**
Q2	i) Determination of the_____ anisotropy ratio must be evaluated as a decision point between vertical development and the use of horizontal wellbores to access CBM gas. a. Porosity b. Cleat c. Fracture d. Permeability ii) Established CBM Reserves (in TCF) in India is about_____ a) 12.5 b) 9.9 c) 8.5 d) 12.7	**CO4**

	iii) Water associated with a CBM a) Adherent moisture b) Inherent moisture c) Chemically bound water d) All of these iv) CBM wells go through the different production stages: The stable stage of the CBM well is characterized by a) A large volumes of groundwater are pumped from the seam to reduce the underground pressure and encourage the natural gas to release from the coal seam b) Amount of natural gas produced from the well increases as the amount of groundwater pumped from the coal seam decreases c) Amount of gas produced declines and the amount of groundwater pumped from the coal seam remains low d) None v) Which of the following coalfields is categorized as Category-I in India for CBM presence. a) Raniganj b) Jharia c) Talchir d) Assam-Arakan	
Q3	i) The gas contents of the Coal seam is expressed as a) cm3/t b) m3/t c) m3/MT d) None ii) Which one of these mechanisms is not responsible for creation of the cleating system of coals: a) Devolatilization during coalification. b) Dehydration during coalification. c) Concentration of organic matter d) Compaction iii) Which of the following is true about the mechanism for gas flow in the coal. a) Desorption of gas from the coal surface inside the micropores b) Diffusion of gas through the micropores c) Darcy flow through the fractures d) All of these iv) The capacity of methane sorption is expressed as a) cm3 /g b) MPa c) m3/g d) cm3/kg v) The basic Equation used to calculate the gas in place is: a) GIP = (h * A) * Dc * Gc b) GIP = (h +A) * Dc * Gc c) GIP = (h * A) + Dc * Gc d) GIP = (h * A) * Dc +Gc	**CO3**
Q4	i) Dry FC 78% or more and less than 86% is found in_____ a) Medium volatile bituminous coal b) High volatile bituminous coal c) Low volatile bituminous coal d) Semi-Anthracite	**CO2**

	ii) Which of the following is not a factor affecting sorption isotherm? a) Temperature b) Reservoir Depth c) Moisture d) Gas Composition iii) Frequency of the cleats is ____ proportional to the thickness of the vitrain layers. a) Directly b) Linearly c) Indirectly d) Inversely iv) The Langmuir equation, used to construct the isotherm of methane sorption on coal as pressure is varied while keeping temperature constant, a path similar to CBM production is expressed as---------- a) V = V max BP/ 1 -BP b) V = V max BP/ 1 + BP c) V = V min BP/ 1 + BP d) V = V max BP/ 1 x BP v) What is the behaviour of Gas Recovered v/s Original Pressure curve in Coal reservoir and Conventional Gas reservoir? a) Linear in Coal reservoir and Non-linear in Conventional Gas reservoir b) Non-linear in both reservoirs c) Non-linear in Coal reservoir and Linear in Conventional Gas reservoir d) Linear in both reservoirs	
Q5	i) Permeability of Coal reservoir is complex due to the high degree of a) Homogeneity b) Rank of Coal c) Spatial variation in maceral composition d) None of these ii) Which of the following statements regarding the physical adsorption of a gas on surface of solid is not correct? a) On increasing temperature, adsorption increases continuously b) Enthalpy changes are negative c) Adsorption is specific d) It is reversible in nature iii) At normal coal bed pressures, absorbed gas occupies roughly_____ of the total gas content in coal, a) 80 to 90% b) 70 to 80% c) 90 to 95% d) 60 to 70% iv) Critical Desorption pressure is the pressure at which a) 1/4 Langmuir volume is adsorbed b) 1/2 Langmuir volume is adsorbed c) 1/8 Langmuir volume is adsorbed d) Complete Langmuir volume is adsorbed v) During absorption of methane in coal there is a continual interchange of molecules between the free gas and the adsorbed gas a) True b) False	**CO2**

Q6	i) Which of these test helps most to determine the heterogeneity of the CBM reservoir along with the degree of connectivity a) Pressure Buildup (PBU) Test b) Below Fracture Pressure-Injection Falloff Test c) Multi-Well Interference Test (Fractured media) d) Drillstem Test(DST) ii) Choose the correct sequence of increasing ROP during CBM drilling for the following drilling fluids. a) Air > Foam > Mist > Aerated Liquid b) Air > Mist > Foam > Aerated Liquid c) Foam > Air > Mist > Aerated Liquid d) Foam > Mist > Air > Aerated Liquid iii) The foam cement places more pressure on the unique cleat structures of coal beds, reducing the tendency of the cement to exceed the fracture gradient of the coal. a) True b) False iv) In some areas, dynamic-cavity completions results in gas rates that are substantially greater than fracture-stimulated wells. a) True b) False v) Hydrofracking is generally highly effective for shallow depths horizontal section in Coal seams For commercial gas production a) False b) True	**CO3**
	SECTION B **1. Each question will carry 10 marks** **2. Instruction: Write short / brief notes**	
Q 7	Write very short notes on any **Four** from following: a) Physical and chemical characteristics of plant debris and coal with maturation b) Why CBM is different from conventional Methane reservoir c) Differentiate between biogenic and thermogenic methane d) CH4 Retention by Coal seams e) How Coalbed methane is Stored in Coal	**CO1**
Q 8	Describe Langmuir Isotherm. What are the applicability of Langmuir Isotherm **OR** Describe in detail the volumetric method of Coal bed Methane Reserve Estimation. How the recovery factor is determined	**CO2**
Q 9	Write short notes on any **TWO** from followings: a) Sorption capacity with geologic parameters. b) Estimation of SCF per ton of CBM c) Proximate Analysis of Coal	**CO2**
Q 10	a) Describe drilling technology of a CBM well. b) What are the advantage and disadvantages of various completion techniques	**CO3**

	OR What is the relationship of Coal porosity and its permeability. Describe the permeability behavior in coal seams during CBM production	
Q 11	a) Schematic of a Vertical Cased Hole Multi-Seam Completion b) What are the factors to be considered for hydro-fracturing in coal	**CO3**
	Section C	
1. Each Question carries 20 Marks. 2. Instruction: Write long answer.		
Q 12	Considering the Technical and Commercial risks, assess the economic viability of a CBM project **OR** a) Describe the status of exploration and exploitation of CBM in India. **b)** Describe the current scenario of CBM production and future of CBM in India.	**CO4**