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| **Name:**<br>**Enrolment No:** | UPES<br>UNIVERSITY WITH A PURPOSE |

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

**Course: Unconventional Hydrocarbon Exploitation** **Semester: V**
**Program: B. Tech APE (UP)** **Time 03 hrs.**
**Course Code: (PEGS 3015)** **Max. Marks: 100**

**SECTION A [6x5=30marks]**

1. **Each Question will carry 5 Marks**
2. **Instruction: Complete the statement / fill the correct answer(s)**

| S. No. | **Question** | **CO** |
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| Q 1 | Fill in the blanks.<br>a) The oil and gas industry records rock and fluid properties with respect to depth using…….. in the geological formations intersected by a borehole.<br>b) …….. type of clay is comparatively less dangerous for swelling effect in shale reservoir.<br>c) Three porosity logs are: porosity, acoustic and _____<br>d) Average density of shale is _____g/cc & coal is……..g/cc.<br>e) For shale formation suitable drilling mud is…….. | **CO1** |
| Q2 | Discuss about shale ductility and its effects on gas production. | **CO1** |
| Q3 | Mention five characteristics of a CBM Reservoir | **CO2** |
| Q4 | Mentions the effects of hydrate phase transition during deep water drilling | **CO3** |
| Q5 | Mention five aspects of $Co_2$ enhanced unconventional hydrocarbon recovery | **CO1** |
| Q6 | List applications of different additives used along with hydrofracturing fluid | **CO3** |

**SECTION B[5x10=50marks]**

1. **Each question will carry 10 marks**
2. **Instruction: Write short / brief notes**

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| Q 7 | Discuss the controlling factors for shale gas exploitation, specifically on adsorption, desorption and free gas capacity estimation. (10) | CO3 |
| Q 8 | Describe about different advanced well types, used in China for enhanced CBM recovery. **[10]** | **CO3** |

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| Q 9 | Drilling problems due to wellbore instability are responsible for about 10 to 20% of the total drilling cost of a well. Discuss about swelling issues and solutions. [10 marks] | **CO3** |
| Q 10 | Illustrate about Gas Hydrate occurrences in Marine Sediments.(10marks) | **CO4** |
| Q 11 | The first indications of methane hydrate in marine sediments were based on the observation of a seismic reflection. [5+5=10 marks]<br>(a) Discuss seismic evidence of gas hydrate and how to demarcate the gas hydrate bearing zones using seismic profile.<br>(b) Analyse gas hydrate extraction techniques. | **CO4** |
| | OR | |
| Q 11 | Illustrate about gas Hydrate Crystal Chemistry and Stability of Gas Hydrates (10marks) | CO4 |
| | **Section C**<br>**1. Question 12 carries 20 Marks.**<br>**2. Instruction: Write long answer.** | |
| Q12 | A shale formation was characterized to assess the gas generation potential using Rock Eval Pyrolysis. Where the free gas released at initial temperature 410degree Celcius, S1 is 4mg/g HC, pyrolyzed gas released is 2mg/g HC, S3 is 1.2 mc$CO_2$/g Rock, TOC =5 %, Tmax is 478 degree,<br>(a) Calculate the Hydrogen Index, Oxygen Index and Production Index for that shale.<br>(b) Interpret the thermal maturity zone and kerogen types.<br>(c) Evaluate the gas generation potential.<br>**(10+5+5)** | **CO5** |
| | **OR** | |
| Q12 | (a) New Albany shale shows HI=24mg/g HC, OI=25mgO2/gHC, evaluate the kerogen type using Van krevalan diagram concept.<br>(b) Discuss about the types of kerogen responsible for shale oil, oil shale and shale gas generation.<br>(c) Analyze the environmental impact on shale gas extraction and highlight how to mitigate the challenges.<br>**(10+5+5)** | **CO5 [10+5+5]** |