Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2021

Course: Reservoir Modeling and Simulation — **Semester : VII**
Program: B. Tech. APE UPSTREAM — **Time : 03 hrs.**
Course Code: PEAU: 4002 — **Max. Marks: 100**

SECTION A

1. All 5 Questions are compulsory. Each Question will carry 4 Marks
2. Instruction: Write short Answer

(Scan and upload) **(5Qx 4M = 20 Marks)**

Sl. No.	Question	Marks	COs
Q 1	Define the objectives of reservoir simulation studies. Write down the uses and misusage of reservoir simulation model.	4	CO1
Q 2	Explain the basic steps in the formulation of all simulator equations. Write down the sources of errors in a numerical model.	4	CO1
Q 3	Explain types of model geometry in reservoir simulation.	4	CO2
Q 4	Define physical model, computer model, mathematical model and differential form of Darcy's law for three-phase flow with suitable equations.	4	CO3
Q 5	Define partial differential equation and equation of state (EOS) for building the reservoir model.	4	CO3

SECTION B

1. Attempt 4 Questions. Each Question will carry 10 marks. Question 4 has internal choice.
2. Instruction: Write medium answer.

(Scan and upload) **(4Qx10M = 40 Marks)**

Q 6	A. Define Principle of MBE. Explain advantages and limitations of material balance equation **(5 Marks)** B. Solve the following if : Cumulative oil production for reservoir was 14.73 $\times 10^6$ STB at the time when reservoir pressure was 900 psig. At the same time, cumulative production of solution gas was 4.05 $\times 10^9$ SCF. Calculate the reservoir volume occupied by released gas. **Given Data:** N = 90.46 $\times 10^6$ [STB] R_{si} at 1225 psig = 230 [SCF/STB]	10	CO2

	R_s at 900 psig = 169 [SCF/STB] B_g at 900 psig = 0.002905 [RB/SCF] **(5 Marks)**		
Q 7	Define hysteresis, aquifer, relative permeability curve, Leverett J-function, free water level (FWL) with suitable equations & figures.	**10**	**CO2**
Q 8	A. Define uses of 0, 1, 2, and 3 dimensional models in detail with suitable Figures. **(5 Marks)** B. Explain ten golden rules of reservoir simulation. **(5 Marks)**	**10**	**CO3**
Q 9	Explain finite-difference formulations, model initialization, IMPES, IMPIS and fully implicit method in simulation. **(10 Marks)** **OR** A. Explain discretization process. Define gridding rules, irregular grids and LGR with suitable figures. **(5 Marks)** B. Define the basics of upscaling. Explain different methods of upscaling. **(5 Marks)**	**10**	**CO4**
SECTION-C **1. Attempt 2 Questions. Each Question carries 20 Marks. Question 2 has internal choice** **2. Instruction: Write long answer.** **(Scan and upload)** **(2Qx 20M = 40 Marks)**			
Q 10	A. Describe the different file section in eclipse data file in detail Set 10 cells to have length of 100 feet using **DX** keyword. Define a box as follows: X direction - cell 1 to cell 10 Y direction - cell 1 to cell 10 Z direction - cell 1 to cell 1 (top layer only) Set the depth below sea level of the tops of each cell in the box to 10,000 feet using the **BOX**, **TOPS** and **ENDBOX** keywords **(10 Marks)** B. Explain the common keywords used to enter data for Cartesian grid and corner point grid entered in IMEX. **(5 Marks)** C. Explain pre-processor and post processor files for CMG simulator. Write down the names of software for used in Static modeling and dynamic simulation. **(5 Marks)**	**20**	**CO6**

Q 11	A. Describe objectives and systematic approach used in history matching. Explain uncertainties in history matching. Describe sort of data should be matched during history match. **(10 Marks)** B. Describe the various Input data and output during prediction performances. Apply the prediction case studies of sandstone reservoir for any Indian or Foreign field. **(10 Marks)** **OR** A. Describe different types of decline curve analysis. Calculate the amount of oil produced for five years with hyperbolic decline method. **Data Given for a well** Initial rate, q_i = 150 STB/D, Initial decline rate, (d_i) = 4% per month Hyperbolic decline rate = 0.8 **(10 Marks)** B. Describe water coning with suitable figures and equations. Discuss the uses of well specifications, production logging data, pressure transient data and historical production data in reservoir simulation. **(10 Marks)**	**20**	**CO5**