Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2023

Course: Reservoir Modelling & Simulation **Semester: VII**
Program: B. Tech. APE UP **Time : 03 hrs.**
Course Code: PEAU 4002 **Max. Marks: 100**

Nos. of page(s) : 3
Instructions: All questions are compulsory.

a. Answers must carry supporting material such as equations and diagrams.
b. Abbreviations used in the questions are standard and have their usual meaning.
c. Make appropriate assumptions where data is not supplied.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between simulator and simulation. Illustrate the necessity and purpose of simulation model. Write down the benefits of computer model.	**4**	**CO1**
Q 2	Define normalization and averaging relative permeability data. List out the applications of relative permeability data in reservoir simulation.	**4**	**CO2**
Q 3	Illustrate the assumptions and advantages of MBE. Explain MBE in oil & gas reservoirs.	**4**	**CO2**
Q 4	Discuss different types of models based on geometry and dimensions with suitable figures in reservoir simulation.	**4**	**CO3**
Q 5	For a BLACKOIL system illustrate the number of unknown and the equation required to solve for these at each time step.	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain how a simulator determines whether the oil is saturated or undersaturated. Calculate the reservoir volume occupied by released gas and remaining reservoir oil volume at 750 psig if cumulative oil production for our example reservoir was 12.73×10^6 STB at the time when reservoir pressure was 750 psig. At the same time, cumulative production of solution gas was 3.05×10^9 SCF.	**10**	**CO2**

	Data Given: $N = 70.46 \times 10^6$ [STB] Rsi at 1125 psig = 220 [SCF/STB] Rs at 750 psig = 162 [SCF/STB] Bg at 750 psig = 0.002505 [RB/SCF] Bo at 750 psig = 1.204 [RB/STB]		
Q 7	(a) Explain requirement of major categories of simulation data. Give a brief description of each type of data. Discuss various techniques of initialization during simulation. (b) Discuss IMPES & Fully IMPLICIT methods of formulation in a simulator by showing an example**.**	**10 (5+5)**	**CO3**
Q 8	(a) Describe Pressure Equations for Black Oil Model for building the reservoir model with suitable figure. (b) Discuss upscaling basis and describe different methods of upscaling with suitable figures in simulation modeling.	**10 (5+5)**	**CO4**
Q 9	Describe the different file section in eclipse data file and define a box as follows: X direction - cell 1 to cell 5 Y direction - cell 1 to cell 5 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 8,000 feet using **BOX**, **TOPS** and **ENDBOX** keywords in Eclipse. **OR** Discuss different types of simulators and uses of each simulator. Explain pre-processor and post Processor files for CMG simulator. Describe golden rules of reservoir simulation.	**10**	**CO6**
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	(a) Discuss discretization and criteria for grid selection in black oil model. Describe irregular grid and local grid refinement with suitable figures. (b) Describe exponential decline curve with suitable figures and equations. A well has declined from 100 BOPD to 95 BOPD during a month period. Assuming Exponential decline, predict the rate after 11 more months and the amount of oil produced after one year.	**20 (10+10)**	**CO4**

Q 11	Discuss the various criteria for selecting the prediction cases. Describe the various Input data and output during prediction performances. Apply the prediction case studies of Sandstone Reservoir for any Indian Field. **OR** Discuss the objectives of History Matching and explain sort of data should be match during history match. Describe the overall steps used in History Matching and general algorithm for manual history matching along with key reservoir data and additional history matching tools.	**20**	**CO5**