Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

Online End Semester Examination, December 2020

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. **Each Question MCQ/TF will carry 5 Marks**
2. **Instruction: Select the correct answer(s)**

Sl. No.	Question	CO
Q 1	A. The basic steps in the formulation of all simulator equations are a. Darcy's law for flow through porous media b. Continuity equation or material balance c. Equation of State for describing the phase behavior of reservoir fluids. d. All of Them B. Petrophysical Model determines a. Rock Wettability & Capillary Pressure b. Relative Permeability & Residual Oil Saturation c. Fluid Contacts d. All of Them C. The physical system to be modeled must be expressed in terms of appropriate a. Numerical Equation b. Mathematical Equation c. Both of Them d. None of The above D. Simulation time depends on the number of grid blocks for a given a. Equations b. Properties c. Variables d. Simulator	**CO1**

	E. Simulator equations are a. Linear b. Non-linear c. Spherical d. Radial	
Q 2	A. The Maximum water saturation at which the water phase will become immobile is Known a. Critical water saturation b. Connate water saturation c. Irreducible water saturation d. All of the above B. Methods for Estimating of Vertical Sweep efficiency a. Stiles' Method b. Dykstra & Parson's Method c. Reservoir Simulation d. None of them C Trapped oil saturation can be minimize by a. Increase Capillary number b. Decrease Capillary number c. Increase Viscosity of oil d. None of the above D. Material Balance is a powerful tool that helps determine the a. Reserves b. Recovery Factor c. Drive Mechanism d. All of them E. A type of formation whose rock properties are same in all directions is called a. Homogeneous formation b. Isotropic formation c. Anisotropic formation b. None of the above	**CO2**
Q 3	A. The assumption not used in the derivation of the radial flow form of the diffusivity equation is a. Flow in to the wellbore continues after the well is shut in b. Uniform thickness across the reservoir c. A fluid with small and constant compressibility d. Homogeneous and isotropic medium	**CO3**

	B. Differential equation mathematical language to express how things a. Remain constant b. Change c. Explain d. Describe C. Derivation of the diffusivity equation based on a. Law of conservation of mass b. Darcy's fluid flow law c. PVT behavior of fluids d. All of the above D. Multi-phase flow is common in most petroleum reservoirs. In such multi-phase systems, we need to quantify the flow of each phase in the presence of other phases. This can be through a. Effective and relative permeability data b. Effective and total porosity data c. Effective Porosity and relative permeability data d. All of the above E. Flow Equations Which Include Non-Darcy Effects a. High Flow Rates (Inertial and Turbulent Effects) b. Threshold and Slip Phenomena c. Non-Newtonian Flow d. All of Them	
Q 4	A. The process of distribution of the fluid saturations, pressures and establishing model in a. Sensitivity Analysis b. History Matching c. Prediction d. Initialization B. Iterative processes of solving simultaneous linear equations are a. Matrix Inversion b. Jacobi Method c. Gauss-Seidel Method d. b & c	**CO4**

	C. Coordinate system used in the model are a. Rectangular b. Cylindrical c. Spherical d. All of Them D. Which of the following methods is used to solve for linear system equations (Finite) a. Explicit b. Implicit c. IMPES d. All of Them E, Cartesian model geometry a. Suitable for all model dimensions b. Used to accurately capture reservoir geometry c. Used for pattern models and full field d. a & c	
Q 5	A. A decline curve of a well is simply a plot of the well's production rate on the y-axis n versus time on the x-axis and when the data plots concave downward, it has modelled with a "hyperbolic decline". (True/False) B. Lower is the value of perforated interval hp the lower will be the penetration ratio and the higher the critical rate. (True/False) C. Lateral breakthrough of water from a down-dip aquifer is coning. (True/False) D. Horizontal well will have high-pressure drawdown and will exhibits minimum coning tendencies. (True/False) E. A good History Matching with appropriate adjustments to the data will lead to poor predictions. (True/False)	**CO5**
Q 6	A. Dual Porosity Simulators can be used for Naturally Fractured Reservoirs. (True/False) B. CMG-IMEX (Conventional "Black Oil") simulator can model the flow of water, oil, and gas, and can account for pressure-dependent solubility of gas in oil, but they cannot model changes in oil and gas composition. (True/False) C. In Eclipse 100 Software, under SOLUTION section specifies output of initial conditions (time > 0). (True/False) D, Reservoir Simulation of highly viscous oil reservoirs can perform by using Eclipse 500 and Stars Simulator. (True/False) E, Simulator selection depends on Types of Simulator, Phases, Geometry and Dimensionality, (True/False)	**CO6**

SECTION B **1. Each question will carry 10 marks** **2. Instruction: Write short / brief notes**		
Q 7	A. Explain the differences between the Classical and Numerical Simulation. Write down some of the sources of errors in a numerical model. B. Define the objectives of reservoir simulation studies. Explain the different steps in a Typical Reservoir Simulation Study.	**CO1**
Q 8	A. Explain MBE in Oil & Gas reservoirs. For a BLACKOIL system list the number of Unknown and the equation required to solve for these at each time step. B. Define Wettability, Relative Permeability, Capillary Pressure, Formation Volume Factor and Bubble Point Pressure,	**CO2**
Q 9	A. Define differential equation and its classification. Explain Partial differential equation. B. Explain differential form of Darcy's law for three-phase flow. Explain the forces that makes fluids move in the porous media in detail	**CO3**
Q 10	Explain Implicit Pressure-Explicit-Saturation, Implicit Pressure-Implicit-Saturation, Upscaling, Model initialization and Discretization process during reservoir simulation.	**CO4**
Q 11	A. Describe the different File Section in eclipse data File. Explain Pre-processor and Post Processor files for CMG Simulator. B. Explain different deliverables for Geo-cellular modeling in Petrel. Write down the names of software for used in Static modeling and Dynamic Simulation.	**CO6**
SECTION-C **1. Each Question carries 20 Marks.** **2. Instruction: Write long answer.**		
Q 12	Describe overall iterative procedure for a history match. Describe general algorithm for manual history matching along with key reservoir data and additional history matching tools. Explain uncertainties in history Matching. **OR** Describe 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.	**CO5**