Introduction to Carbon Capture and Storage (이산화탄소 포집 및 저장 개론) (38535-01)

- 2021 Midterm Examination -

Student ID:

Student Name:

Notice

• Fill your name below and write the whole sentence in your answer sheet:

"I, _____, swear I solve all problems by myself in this midterm examination. I will take any disadvantages if any dishonesty such as cheating is acted on my solution."

5 points will be deducted from your total score if you do not fill in your name above.

- You MUST solve each problem by hand.
- Submission Deadline: 16:45~17:00 PM, April 19, 2021.
- No late submission is accepted.
- Submit your solution as *.pdf or *.word file on the cyber campus.
- Please follow the format that gives a name to your solution file:

(Mid)-(Student ID)-(Last name)-(First name)

For example, the file name must be Mid-XXXXXX-Min-Baehyun.

Problem 1.

Provide the full name of each acronym:

- 1-1. CCUS [1 pts.]
- 1-2. IPCC [2 pts.]
- 1-3. IEA [2 pts.]
- 1-4. BAU [2 pts.]

Problem 2.

Based on your reservoir engineering knowledge, assign a Y-axis title and its unit to each subfigure from 2-1 to 2-4. [4 pts.]



Problem 3.

Explain the Net Zero Scenario announced in BP's Energy Outlook 2020, in brief. [5 pts.]

Problem 4.

- 4-1. Draw a phase diagram of pure CO₂ with its critical point. [3 pts.]
- 4-2. How much are critical pressure and temperature of pure CO₂? [3 pts.]
- 4-3. Explain dense phase fluid. [3 pts.]
- 4-4. Explain supercritical fluid. [3 pts.]
- 4-5. What happens to the phase diagram if impurities are added to the pure CO₂? [3 pts.].

Problem 5.

Compare six conventional options for storing CO_2 in deep underground geological formations for CO_2 . For a fair comparison, describe each geological options with three sentences. [18 pts.]

Problem 6.

6-1. Draw a graph to compare four primary CO_2 trapping mechanisms of in terms of time since cessation of injection (years) and trapping contribution (%) [10 pts.].

6-2. Explain how residual gas saturation is controlled by pore geometry in terms of pore/throat size ratio and coordination [10 pts.].

Problem 7.

According to the workflow of reservoir simulation, list the following processes in order. [5 pts.]

- (A) Initialization Settings
- (B) Reservoir Definition
- (C) Production
- (D) Fluid Definition
- (E) Well Definition & Operation
- (F) Rock-Fluid Information
- (G) Numerical Controls

Problem 8.

This figure was captured from the Lecture Note RE2.1 Scenarios of Prediction: Water Injection. Explain why the location of Well 16 (i.e., wl16) is appropriate as a water injection well with consideration for given reservoir properties. [6 pts.]



Problem 9.

Below figures compare simulation results of structural trapping (left) and hysteresis trapping (right) where CO_2 has been injected for 1 year and migrated for the subsequent 200 years. Analyze the simulation results based on your engineering knowledge [10 pts.].



Problem 10.

Fill the ten blanks from ① to ⑩ [10 pts.].

Image: Description of the second s



System: For a constant rate of injection, fluid from the cell will be exactly balanced by fluid entry across the open boundary



----- This is the End of the Midterm Examination ------