Introduction to Energy Resources
(자원공학개론) (38523-01)

- Final Examination -

Student ID: **Name:**

Problem 1.

For the sub-problems from 1-1 to 1-5, give the full names of the following abbreviations:

(1)   API [2 pts.]
(2)   STB [2 pts.]
(3)   scf [2 pts.]
(4)   bbl [2 pts.]
(5)   CESE (기후·에너지시스템공학과의 영어 이름) [2 pts.]

Problem 2.

Describe the five assumptions for Darcy's law, in brief [10 pts.].

Problem 3.

(1) Derive Darcy's equation for the horizontal radial flow in any units [5 pts.].
(2) Derive the Darcy's equation for slightly compressible flow in field units. Express the volumetric flow in bbl/day, where bbl means barrel [5 pts.]

(3) Derive the Darcy's equation for compressible flow in field units. Express the volumetric flow in scf/day [10 pts.].

(4) Show your work that 1 Darcy is (approximately) equal to 9.869×10^{-9} cm^2 [10 pts.].

Problem 4.

Explain the Klinkenberg effect for gas permeability, in brief. [10 pts.].

Problem 5.

Describe the definition of absolute, effective, and relative permeabilties [10 pts.].

Problem 6.

Well properties are given below. Production rate (Q) of the undamaged well is 500 bbl/day.

r_e = 600 ft, r_w = 0.25 ft, μ_o = 1.6 cp, h = 20 ft, k_i = 50 md.

(1) Due to drilling mud intrusion, permeability of the near-wellbore area (from the center of the well to 30 ft) is decreased to 10 md. Calculate the <u>average permeability</u> of this formation. Also, predict the <u>decreased</u> production rate [10 pts.].

(2) An operator performed the acidization job for increasing well productivity. After acidization, permeability of the near-wellbore area (from the center of the well to 20ft) is increased to 150 md. Calculate the <u>average permeability</u> of this formation. Also, predict the <u>increased</u> production rate [10 pts.].

Problem 7.

Fill in the two blanks [5 pts].

Strongly (   )-Wet Rock   Strongly (   )-Wet Rock
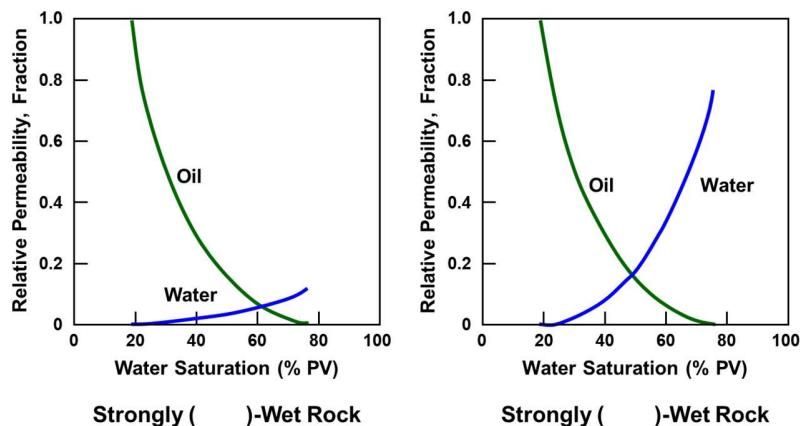
Problem 8.

Select all imbibition situations [5 pts.].

(a) Evolution of a secondary gas cap as reservoir pressure decreases

(b) Gas injection in an oil or water wet oil reservoir

(c) Accumulation of condensate as pressure decreases in a dew point reservoir

(d) Waterflooding an oil reservoir in which the reservoir is water wet

(e) Hydrocarbon (oil or gas) filling the pore space and displacing the original water of deposition in water-wet rock

(f) Waterflooding an oil reservoir in which the reservoir is oil wet

(g) Accumulation of oil in an oil wet reservoir

(h) Pressure maintenance or gas cycling by gas injection in a retrograde condensate reservoir

-------------------- **This is the End of the Final Examination** --------------------