

رقم الطالب:

اسم الطالب:

**ملاحظة:** الرجاء تسليم ورقة الامتحان مع كراسة الاجابة

**Question 1:** (15 points).

Define the following terms

- |                                      |                       |                                      |                    |
|--------------------------------------|-----------------------|--------------------------------------|--------------------|
| 1. Petroleum                         | 2. Surface tension    | 3. Primary Porosity                  | 4. Stuck pipe      |
| 5. Interfacial Tension               | 6. Capillary pressure | 7. Permeability                      | 8. Wettability     |
| 9. Effective Porosity                | 10. Traps             | 11. kerogen                          | 12. Reservoir Rock |
| 13. Drilling Contractor<br>(Example) | 14. Source Rock       | 15. P Operating Company<br>(Example) |                    |

**Question 2:** (15 Points).

- A. What is the pressure in (psi) and temperature in ( $F^{\circ}$ ) at a depth of 10000 ft with a mud weight of 13 lb/gal and a surface temperature =  $25 C^{\circ}$  and a temperature gradient =  $0.01 F^{\circ}/ft$ ?
- B. What is the permeability in *Darcy* for a **cylindrical** core sample if length  $L = 10 cm$ ; viscosity of fluid  $\mu = 1 cp$ ; core sample radius  $r = 2 cm$ ; flow rate  $Q = 25 cm^3/min$ ; and pressure drop  $\Delta P = 3.40 atm$ .
- C. What is the porosity of a rock sample with Bulk volume =  $9.9 cm^3$ ; Weight of dry sample in air =  $20 gr$ ; Sand grain density =  $2.67 gr/cm^3$ . Grain volume =  $7.5 cm^3$ .
- D. How much oil exists in the field if Area of field =  $650 acres$ ; Average sand thickness =  $20 ft$ ;  $\phi = 20 \%$ ;  $S_w = 30 \%$ ,  $B_o = 1.20$ .
- E. What is the height of a gas in a tube if the gas specific gravity = 0.66, average compressibility factor  $z = 0.8$ , average temperature =  $600 R^{\circ}$ , pressure at surface is 14.7 psi and at the bottom of the tube is 15 psi?

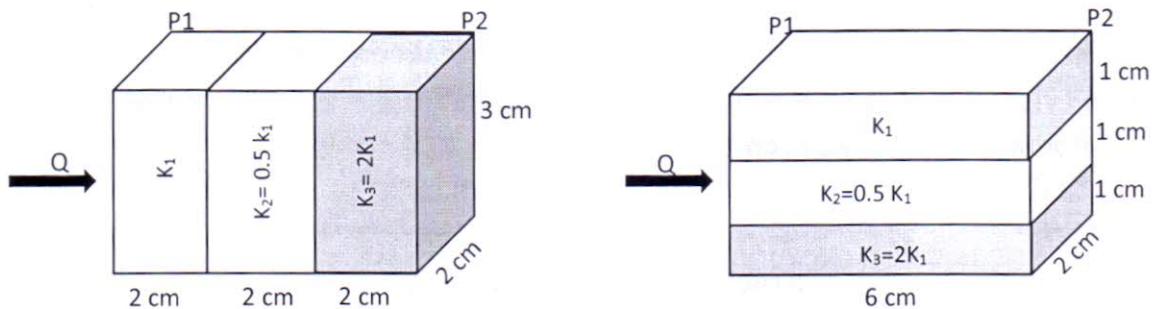
- F. What is the overburden pressure for a formation at a 15,000 ft depth, fluid density = 9 lb./gal, rock matrix density = 23.1 lb./gal and rock porosity = 17%.
- G. Water and oil co-exist in a rock pore; oil droplet pressure = 12 psi and makes  $20^\circ$  angle with the rock surface, while water droplet pressure = 15 psi and makes  $170^\circ$  angle, what is the capillary pressure inside the pore?

**Question 3:** (15 Points).

- List the most currently used geophysical exploration methods.
- List the Oil Rig types, Give one examples for each type.
- List general rock types with one example for each type.
- List the four recovery stages of an oil/gas reservoirs.

**Question 4:** (15 Points).

An incompressible fluid with a viscosity of ( $\mu = 1$  cp) is flowing in a laminar flow pattern at a rate of ( $Q=12$  cm<sup>3</sup>/sec) through the rock arrangements shown below, if the pressure drop ( $\Delta P = P_1 - P_2$ ) across both rocks is 8 atm, calculate  $K_1$ ,  $K_2$  and  $K_3$  in Darcy in both rocks.



**Bonus Question:** (5 points).

- What is the current average price of crude oil?
- What is the current average price of natural gas?
- Which country consumes the highest share of the global oil production?
- Which country has the largest proven oil reserves?
- Which country has the highest proven gas reserves?