Misurata University — Petroleum Engineering Department

Faculty of Engineering — Horizontal Well Technology PE514

Date; 22nd Jan 2014 **Final Exam** Time; 2:00hrs

Note; Exam sheet associated with an open sheet which contains difficult equations

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Q1 - a) Define the following terms or abbreviations as per horizontal well technology subject;

1- Pilot Hole
2- Target Location
3- B.U.R

(5 Points Each)

b) In 50 acre lease size, what is the maximum length of a well located centrally and diagonally using Medium and Long radius drilling technique, suppose the area in a square shape? (10 Points)

Q2- a) List the applications of directional drilling technique.
b) List the types of directional well profiles and discuss one of them.
c) What is the advantages and disadvantages of using slotted liner completion in horizontal wells
d) What are the main objectives of transient pressure analysis in horizontal wells
e) The best choice after the completion of new horizontal well would be long duration of Draw Down test followed by Build up test, what is the reason behind this sequence? (5 Points Each)

Q3- It has been decided to drill a well with a build and hold profile; the well will be drilled to the following specifications;

Target Depth (TVD); 10,000ft — Kick off Point; 1,500ft
Horizontal departure; 3,500ft — Build up rate; 1.5° per 100ft

Calculate the following;

a) The drift angle of the well
b) The TVD @3,500ft MD
c) The TVD at the end of the build up section
d) The maximum horizontal deviation @7,000ft TVD
e) The total measured depth to the target (5 Points Each)

Q4- It is proposed to drill a 65° slant well in a reservoir the following reservoir parameters are known. well spacing = 150 acres $K_v=K_h=60md$ $r_w = 0.31ft$

a. Calculate the PIF of the slant well using Cinco correlation for 40ft, 140ft and 400ft thick reservoir if the well producing from the central section. (9 Points)

b. Calculate the PIF of the slant well using Cinco correlation for $K_v/K_h=0.2$ and 0.6, if h=140ft and the well producing from the bottom section. (8 Points)

c. What is the maximum length of 61° slant well that can be drilled in a 400-ft-thick reservoir. (8 Points)

Good luck

$$q_h = \frac{0.007078 * K_h * h * \Delta P}{\mu_o * B_o * Ln\left[\frac{a + \sqrt{a^2 - \left(L/2\right)^2}}{\left(L/2\right)}\right] + \left(h/L\right) * Ln\left[h/2r_w\right]}$$

$$q_v = \frac{0.007078 * K_v * h * \Delta P}{\mu_o * B_o * Ln\left[r_e/r_w\right]}$$

$$a = \left(L/2\right) * \left[0.5 + \sqrt{0.25 + \left(2r_{eh}/L\right)^4}\right]^{0.5}$$

$$r_w^{\backslash} = \frac{r_{eh} * \left(L/2\right)}{a * \left[1 + \sqrt{1 - \left(L/2a\right)^2}\right] * \left(h/2r_w\right)^{h/L}}$$

$$r_w^{\backslash} = r_w \exp(-S)$$

$$S_S = -\left(\frac{\alpha^{\backslash}}{41}\right)^{2.06} - \left(\frac{\alpha^{\backslash}}{56}\right)^{1.865} * Log\left(\frac{h_D}{100}\right)$$

Cinico correlation of slant wells

$$\alpha^{\backslash} = \tan^{-1}\left(\sqrt{\frac{K_V}{K_h}} * \tan\alpha\right)$$

$$h_D = \frac{h}{r_w} * \sqrt{\frac{K_h}{K_V}}$$

Well producing from the top or the bottom

$$h_D = \frac{h}{2r_w} * \sqrt{\frac{K_h}{K_V}}$$

Well producing from the center

$$\frac{J_S}{J_V} = \frac{Ln\left(\frac{r_e}{r_w}\right)}{Ln\left(\frac{r_e}{r_w^{\backslash}}\right)}$$