PART ONE – Horizontal Drilling:

1- A) Mention four information required starting and completing a horizontal well?

B) In horizontal drilling, both measured depth (MD) and true vertical depth (TVD) are important. Give two field applications of each, in which MD and TVD are necessary.

C) Mention two systems of measurement while drilling (MWD) and which system would you use in case of lost circulation potential and argue Why?

2- Explain the following items related to horizontal drilling:
   - Dog leg severity
   - Azimuth
   - Tangent section
   - Fatigue
   - Sliding
   - Dump sub
   - Closure
   - Vertical section

3- The plan is to run a PDC bit with mud motor either of 7/8 lobe or 4/5 lobe. Which type of mud motor would you select and why? What is the other important performance specification, which has to be considered in this case?

4- Calculate the toolface setting and the direction of bit turning to achieve the following hole target.

   Current:  
   - Inclination = 2°  
   - Azimuth = 314°

   Desired:  
   - Inclination = 3°  
   - Azimuth = 282°

5- A combination horizontal well consist of a tangent section and two different build sections, is to be drilled with the following data:

   Upper build:  
   - 5 deg/100 ft to 60°

   Tangent Section Length  
   - 400 feet

   Lower build:  
   - 8 deg/100 ft to 90°

   Length of horizontal section  
   - 1500 ft

   The KOP-depth is 5254 ft

   Answer the following:
   1- Provide a drawing of the well profile
   2- The total true vertical depth (TVD) of the well
   3- The total horizontal displacement
   4- The measured depth of the well
   5- What might be the reason behind such well configuration?

cont. …..
Part Two - Well Control

6- Given are the following Data of a well:

Casing Size = 13-3/8" OD (ID = 12.615")
Casing Shoe depth = 5210 ft
Bit Diameter = 12.25"
Hole depth = 5410 ft
Drill Collars = 8.25” OD and 2.75” ID
Length of Drill collars= 279 ft
Drill pipe = 5” OD and 4.276” ID

Capacities
DP-capacity = 0.0177 bbls/ft
DC-capacity = 0.0073 bbl/ft
CSG to pipe Annulus ??
OH to pipe annulus ??

Pumping Data
Pump Output = 0.109 bbls/strke
Slow Circulating Rate Pressure at 45 SPM = 1100 psi

Fracture Data
Max. Allow. Annular Surface Pressure = 1119 psi
Mud Weight in Hole at Test = 9.5 ppg

Kick Data
Present Mud Weight = 9.8 ppg
SICP = 580 psi
SIDPP = 480 psi
Pit Gain = 27 bbl’s

Calculate the following:
A) Kill Mud Weight
B) Fracture Mud Weight
C) Leak off test pressure with current mud in hole
D) Surface to Bit strokes and time
E) Total Circulation strokes for Driller's method
F) Gradient of Influx
G) ICP and FCP
H) Drill pipe pressure using kill mud weight after pumping 700 strokes and 950 strokes.
I) What would be the influx gradient and type of influx, if the SIDPP is equal to SICP.
J) Provide plots of drill pipe pressure and annulus pressure of start up procedure to kill the well.

7- Mention the reason behind the difference between SIDPP and SICP.
8- Explain the term "Drilling Break" as an indication of kick.
9- Mention one advantage and disadvantage of the soft shut in procedure.

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