

Answer all questions

Question No 1 (12 marks)

1. Mention only three cases of directional drilling application.
2. list the three type of tools used to deflect the bit in the desired direction
3. Give the distinguish character (radius, rate of build, and length) of ultra short, short, and medium of horizontal wells radius.
4. Define the following terms:
 - A. Measured depth
 - B. Course departure
 - C. Survey azimuth

Question No. 2 (18 marks)

1. It is desired to drill a directional well. For this well, a build and hold trajectory will be used. Horizontal departure to target (X_3) is 2655 ft at a TVD of 9650 ft. The recommended rate of build is $2^{\circ}/100$ ft. The kickoff depth is 1600 ft. determine the following:
 - A. The radius of the curvature(r_1)
 - B. The maximum inclination angle(θ)
 - C. The measured depth to the end of the build(D_m)
 - D. The total measured depth(D_{tot})
 - E. The horizontal departure to the end of the build(X_2)
 - F. The TVD at the end of the build section(D_2)
 - G. The measured depth at a TVD of 1915 ft.
 - H. The horizontal displacement at a TVD of 1915 ft.
 - I. The measured depth at a TVD of 7614 ft.
 - J. The horizontal departure at a TVD of 7614 ft.
2. What are the direction, in alternative format, of each of the following wells:

- A. Well A 59°
- B. Well B S 83 W
- C. Well C 90°
- D. Well D N18W

Question No 3 (18 marks)

1. Calculate the trajectory for the well from 8000 to 8400 ft. where the kickoff is at 8000 ft and the rate of build is $1^{\circ}/100$ ft, using a lead of 10° and right hand walk rate of $1^{\circ}/100$ ft. direction to the bull s eye is 30° . Assume that the first 200 ft is to set the lead, where the direction is held constant to 8200 ft. and then turns right at rate of $1^{\circ}/100$ ft.

Note: for the first point the direction should not be averaged.

2. Write down the factors that the size and the dimensions of the target are usually based on.

Question No 4 (12 marks)

1. Determine the new direction for a deflection tool set at 705m with a tool face setting of 45° right of high side for a course length of 10m. The inclination is 7° and the direction is N15W of 705m. The dog leg severity is 3° and index of angle change is 30m.
2. Calculate the dogleg severity (δ) and tool face angle (γ) for the following data:

Direction change ($\Delta\varepsilon$) = 25°

Initial inclination angle (α) = 5°

Final inclination angle (α_N) = 7°

Course length (L_c) = 60ft.

Index of angle change (i) = 100ft.