

## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech GSE and B.Tech GIE

Subject (Course): Drilling Engineering and Well Completions

Course Code : PTEG211

No. of page/s: 3

Semester – 3<sup>rd</sup>

Max. Marks: 100

Duration: 3 Hrs

### SECTION A (5 x 4 = 20 marks)

1. Describe the properties of a completion fluid
2. Explain the term Magnetic Declination. Given Magnetic Declination = 3° West. Measured Azimuth is S 45° W. Calculate the True Azimuth.
3. Mention and explain the indications of a kick.
4. While drilling a section with 80 pcf mud of 10000 ft well. The following data are recorded.  
DPSIP = 300 psi  
CSIP = 500 psi  
Calculate the formation pressure of that section and the kill mud weight.
5. Calculate the dog leg severity if the following data are noted:  
 $I_1=15^\circ$ ,  $I_2=19^\circ$ ,  $A_1=320^\circ$ ,  $A_2=310^\circ$  and length of interval between the survey points is 200ft.

### SECTION B (4x 10 = 40 marks)

#### 6. Case Study:

A well was drilled to hit a target zone at 12000 ft where a huge reserve of gas was anticipated. The well kicks off at a depth of 3000 ft and follows a profile of S type. While drilling at a depth of 2000 ft, the hole got deviated from the vertical profile and somehow the well was brought back to the original position. After achieving the maximum inclination at a depth of 5000 ft the well was locked in till 10000 ft and finally it hits the target at 12000ft successfully.

Answer the following questions:

- a. Mention the type of BHA that was used at a depth of 2000 ft to bring back the well into its original path. Discuss the working principle.

- b. Mention the name of the section describing the length from 3000ft to 5000ft. Name some tools with which this can be achieved.
  - c. Mention the name of the section describing the length from 10000ft to 12000 ft. Describe the BHA used to achieve this profile.
  - d. Mention the BHA used to drill the locked in section of this well. Describe the working principle.
  - e. Given that the locked in section has a severe crooked hole tendency, draw the BHA configuration for achieving a steady hole.
7. Using the graphical method, determine the required orientation of the deflection tool to change the hole direction from N40E to N55E. Assume the hole inclination is 7.5° and maximum dog leg severity is 3°/100ft.
  8. Elaborate Lost Circulation. Describe briefly two surveys to detect a lost circulation zone.
  9. Describe the procedure for casing seat selection with proper schematic.

### **SECTION C (2x 20 = 40 marks)**

10. Primary Cementing of 7 inch Production Casing:

Hole Depth = 13900 ft

Hole Size = 8 ½ “

Casing shoe = 13891 ft

Mud Weight = 87 pcf

Casing Dimensions = OD/ID = 7 in/6.184in; Grade C95 29#

Cement Details:

Cement Column should be 6562ft long as follows:

From shoe to 656 ft use API Class G cement from 656 ft to 6562 ft use API Class H cement with 2 % Bentonite and 0.3 % HR-4

To prevent contamination of cement by mud 30 bbls of fresh water should be pumped ahead of cement.

Allow 15 mins for plug release

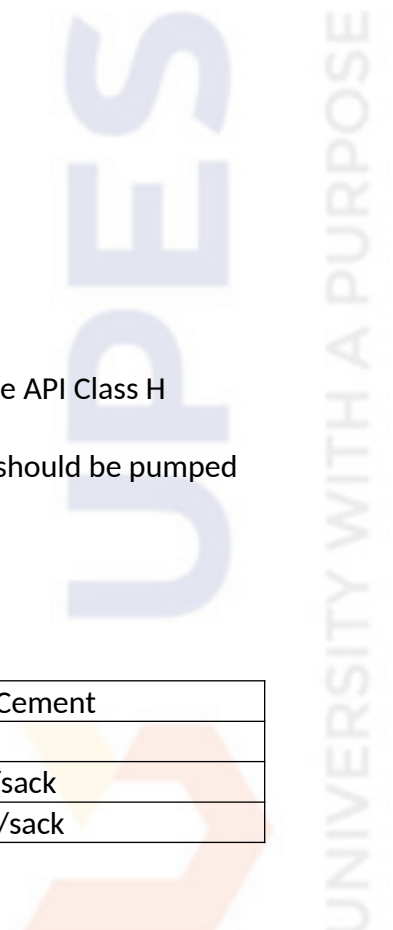
Shoe track : 80ft

Mix cement at 25 sacks/min and displace cement at 300 gpm

	Class G Cement	Class H Cement
Slurry Weight	118 pcf	115 pcf
Slurry Volume	1.15 ft <sup>3</sup> /sack	1.22 ft <sup>2</sup> /sack
Mix water	5 gal/sack	5.49 gal/sack

Calculate:

- a) Quantity of Cement of each class.
- b) Volume of Mix Water
- c) Total Time for the job
- d) Pressure Differential prior to bumping the Plug.
- e) Annular Velocity during Chase.



11. During Drilling of an 8.5inch hole at 10,000ft, a kick was encountered. The well was shut in and the pressure recorded on both drillpipe and annulus were:

DPSIP = 200psi

CSIP= 400psi

Other relevant data include:

Last casing = 9 5/8 inch, N80, 43.5 lbm/ft, ID = 8.755 inch

Casing Setting Depth= 8600ft

Drill Collars: 8inch / 3 inch , 500ft

Drill Pipe = standard D/P

Circulation pressure (normal) = 2000psi at 60 strokes per minute

Circulation Pressure at 30 spm = 500 psi

Present mud weigh = 75 pcf

Pupm Displacement = 0.1 bbl/stroke

Casing Burst pressure = 5930 psi

***Draw the trends in standpipe pressure and Casing Pressure vs both time and stroke when used wait and weight method to kill the well.***

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