UPES

End Semester Examination, December-2024

Programme Name: M.Tech Petroleum Engineering   **Semester: I**
Course Name: Drilling Engineering   **Time: 03 hrs**
Course Code: PEAU 7001   **Max. Marks: 100**

Instructions:
- ➢ **All questions are compulsory.**
- ➢ **However, internal choice has been provided. You must attempt only one of the alternatives in all such questions.**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Define buildup rate, dropoff rate and azimuth angle.	**04**	**CO1**
Q2	Define normal, abnormal & sub-normal pressures considered during well Control.	**04**	**CO1**
Q3	List the main components involved in cement slurry preparation.	**04**	**CO2**
Q4	Discuss mud pulse telemetry systems	**04**	**CO2**
Q5	Discuss the advantages of Rotary steerable system over mud motor bent sub systems.	**04**	**CO2**

SECTION B
(4Qx10M=40 Marks)

Q 6	a) Summarize different considerations needed while planning a directional well b) List out the different deflection tools used in directional drilling. Explain Jetting techniques with their advantages and disadvantages.	**10**	**CO2**
Q 7	A production casing with a collapse rating of 9,250 *psi* was planned to run in the production hole of a well. When casing was run empty to a certain depth, collapse pressure was measured to be half of the collapse rating. When the casing was at the bottom of 17,500 *ft*, safety factor of the collapse was calculated to be 1.3. If the mud weight of the fluid in the annulus was 16.8 *ppg*, determine the mud weight of the fluid inside the casing.	**10**	**CO3**
Q 8	Explain the types of casings and their functions. **OR**	**10**	**CO3**

	Discuss the types of well completion methods in detail.		
Q 9	Differentiate between single stage cementing operation and multi-stage cementing operation.	**10**	**CO4**

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SECTION-C
(2Qx20M=40 Marks)

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Q 10	In an oil and gas project while designing a deviated well, it has been decided to sidetrack a well from 1500 ft. The sidetrack will be a build and hold profile with the following specifications: 	**20**	**CO4**

Target Depth	: 10000 ft.
Horizontal departure	: 3500 ft.
Build up Rate	: 1.5^o per 100 ft.

Calculate the following:
a. the drift angle of the well.
b. the TVD and horizontal deviation at the end of the buildup section.
c. the total measured depth to the target

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OR

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Discuss the properties of class G & H cement and also discuss the cement additives. Analyse the role of heavy weight and fluid loss additives in cement slurry.

Q 11	The 13 3/8" casing string of a well is to be cemented using class 'G'cement. Calculate the following for two stage cementing calculation: a) The required number of sacks of cement for a 1st stage of 700 ft. and a 2nd stage of 500 ft.(Allow 20% excess in open hole) b) The volume of mixwater required for each stage. c) The total hydrostatic pressure exerted at the bottom of each stage of cement (assume a 10 ppg mud is in the well when cementing) d) The displacement volume for each stage.	**20**	**CO5**

20" Casing shoe		: 1500 ft
13 3/8" Casing	77 lb/ft	: 0 - 1000 ft
13 3/8" Casing	77 lb/ft	:1000 - 7000 ft.

17 1/2" open hole Depth   : 7030 ft.

Stage Collar Depth   : 1500 ft.

Shoetrack   : 60 ft.

Cement stage 1   (7000-6300 ft.)

Class 'G'

Density   :15.9 ppg

Yield   : 1.18 ft^3/sk

Mixwater Requirements   : 0.67 ft^3/sk

Cement stage 2   (1500-1000 ft.)

Class 'G' + 8% bentonite

Density   : 13.3 ppg

Yield   : 1.89 ft^3/sk

Mixwater Requirements   : 1.37 ft^3/sk

VOLUMETRIC CAPACITIES

	bbls/ft	ft³/ft
Drillpipe		
5" drillpipe :	0.01776	0.0997
Casing		
13 3/8" 72 lb/ft :	0.1480	0.8314
13 3/8" 77 lb/ft :	0.1463	0.8215
Open Hole		
26" Hole	0.6566	3.687
17 1/2" Hole	0.2975	1.6703
Annular Spaces		
26" hole x 20" Casing:	0.2681	1.5053
17 1/2" hole x 13 3/8" Casing:	0.1237	0.6946
30" Casing x 20" Casing:	0.3730	2.0944
20" Casing x 13 3/8" Casing:	0.1816	1.0194