Name: **Roll No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Sem Examination, May-2022

Programme Name: M.Tech Petroleum Engineering **Semester: II**
Course Name: Advanced Drilling Engineering **Time: 03 hrs**
Course Code: PEAU 7018 **Max. Marks: 100**

Instructions:

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

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	"You are the company man on a well being drilled. Well takes a kick. What will be your course of action?	**04**	**CO1**
Q2	Define PDC Bits and major components of PDC bit design?	**04**	**CO2**
Q3	Optimizing weight on bit (WOB) is an essential part of drilling to ensure that the well deepens as drilling moves forward. Justify.	**04**	**CO3**
Q4	What is the normal range of pH of a drilling mud? Why a very high pH is undesirable in drilling muds?	**04**	**CO2**
Q5	Define KOP, inclination angle and azimuth angle?	**04**	**CO1**

SECTION B
(4Qx10M=40 Marks)

Q 6	Discuss the application of rheology control and lost circulation materials in drilling fluids. Discuss two properties of drilling fluids and their importance.	**10**	**CO2**
Q 7	a) Discuss the chipping and grinding action of rock cutting mechanism with neat clean diagram. b) Explain the design criteria for rolling cutter bits **OR** The following table shows the bit performance of three bits for a sandstone formation at 10,000 ft depth. Determine which bit gives the lowest drilling cost if the fixed operating cost of the rig is $500/hr, and the trip time is 8 hours.	**5+5**	**CO3**

		10	**CO3**

Bit	**Bit Cost ($)**	**Total rotating time (*hrs*)**	**Total non-rotating time (*hrs*)**	***ROP* (*ft/hr*)**
A	950	25.5	0.25	12.0
B	1500	42.0	0.40	10.5
C	2000	70.5	0.7	8.5

Q 8	a) Summarize different considerations needed while planning a directional well? b) List out the different deflection tools used in directional drilling? Explain whip stock tool types with their advantages and disadvantages?	**5+5**	**CO4**
Q 9	Differentiate between primary, secondary and tertiary well control methods?	**10**	**CO5**

SECTION-C
(2Qx20M=40 Marks)

Q 10	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**	**CO4**

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

OR

Q 10

a) Wells are designed telescopically", discuss your views to justify it. Explain the failures and stability of casing along with the types of casing.
b) Discuss the properties of class G & H cement powders and role of accelerators and retarders in cement slurry additives.

10+10 **CO4**

Q 11

i) 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:

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

ii) Discuss the advantages of Rotary steerable system over mud motor systems

15+5 **CO5**

All the Best!!