Name:

Enrolment No:

UPES
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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: Drilling Engineering and Well Completions — **Semester: 4th**
Program: B.Tech APE UP — **Time 03 hrs.**
Course Code: PTEG 211 — **Max. Marks: 100**

Instructions: Attempt all the questions. Internal choices are provided in Q9 and Q11.

SECTION A (5 x 4 = 20marks)

S. No.		Marks	CO
Q1	Describe the difference between a TCR and PDC bit along with their applications. (1+3 = 4 marks)	4	CO1
Q2	A fracture gradient in a soft zone was found to be 0.82 psi/ft. Decide a cementing program to cement an intermediate casing (8000 ft) with 126 pcf Class G cement.	4	CO3
Q3	Distinguish between the working of a Rotary Kelly Drive Rig and a Top Drive Rig.	4	CO1
Q4	If a MOP of 100,000 lb is to be maintained; is a drilling operation safe with the given information: D/P length = 10,000 ft. API X-95, Premium, 19.5 lb/ft D/C weight = 128,000 lbs Well Depth = 11,000 ft	4	CO2
Q5	Describe the trend in Circulation Pressure and SPM while a kick is encountered, with justification.	4	CO4

SECTION B (4 x 10 = 40 marks)

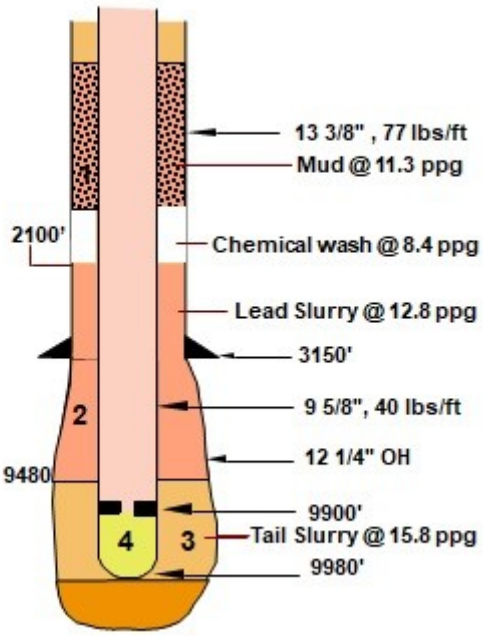
Q6	Analyse the cost/ft for the following bit types which were used to drill the same type of formation in three wells. Which bit would you select for the next well?						10	CO6

Well No	Bit Type	Depth in (ft)	Depth Out (ft)	Footage Drilled	Rotating Time (hrs)	Trip Time (hrs)
1	XX	5468	8138	2670	144	8
2	XY	4973	7795	2822	180	8

Assume bit cost = $10,000 and Rig cost= 900 $/hr.

Q7	Remember and draw a schematic of Wellhead Assembly and a X-Mas Tree with appropriate labels.	10	CO5
Q8	Remember the fundamental physics of cement setting process and answer the following briefly: **(5 x 2 = 10 marks)** 1. Describe the driving criteria to make the cement more sulphate resistant. 2. Mention the prime modification necessary to make the cement immune to the phenomenon of Strength Retrogression.	10	CO3

	3. The difference between API Class G and Class H cements. 4. How do we induce an artificial induction time during the cement setting process 5. Describe C-S-H and C-A-H gel along with their differences.		
Q9	Describe the types of Casing and Liners with their functions and applications. **OR** Elaborate on the process of Well Construction in sequence until the well is perforated and activated. (A flow chart is preferred over long texts).	**10**	**CO2**
	SECTION-C (2 x 20 = 40 marks)		
Q10	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 ***1. Graphically represent the trend in Standpipe pressure against time and stokes (10 marks)*** ***2. Calculate the time taken to kill the entire well. (10 marks)***	**20**	**CO4**
Q11	***(a) <u>Analyse the given data and answer the following:</u>*** ● Primary Cement Job – 9 5/8" Csg , 40 lbs/ft – Shoe @ 9980' - Collar @ 9900' – Tail slurry @ 15.8 ppg to 9480' – Lead slurry @ 12.8 ppg to 2100' – 50 Bbls Chemical Wash ahead. ● Previous Casing – 13 3/8" Csg ,77 lbs/ft – Shoe @ 3150' ● 12 1/4" OH - Assume 10% Excess.	**20**	**CO3**



Question:

1. Find Lead, Tail and Displacement Volumes required. (**10marks**)
2. Calculate Differential pressure at the end of the job (ignore friction) (**10marks**)

OR

(b) Design a Directional Well by analyzing the mentioned case and answering the following questions:

It is desired to drill under the lake to the location designated for Well 2. For this well, a build-and-hold trajectory will be used. Horizontal departure to the target is 2,655 ft at a TVD of 9,650 ft. The recommended rate of Build is 2 deg/100ft. The kick off depth is 1600ft. Determine:

1. The radius of Curvature, R_1. (2marks)
2. The maximum inclination angle. (2marks)
3. Measured depth to the end of build up. (2marks)
4. The total measured depth (2marks)
5. The horizontal departure to the end of the build up. (2marks)
6. The measured depth at a TVD of 1915ft. (2marks)
7. The horizontal displacement at a TVD of 1915 ft. (2marks)
8. The measured depth at a TVD of 7614 ft. (2marks)
9. The horizontal departure at a TVD of 7614ft. (2marks)
10. Mention possible BHA configuration for all the sections (2marks)