

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Safety in Drilling (HSFS 7008)
Program: M.Tech HSE & M.Tech HSE Spl in DM
Time: 03 hrs.

Semester: II

Max. Marks: 100

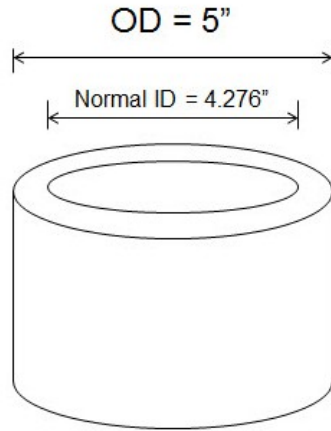
Instructions: Please read all the questions before giving answers

SECTION A

S. No.		Marks	CO
Q 1	Explain in brief the significance of shut in procedures?	4	CO3
Q 2	State the importance of drilling mud. In what respect it is used to control solids in a Drilling fluid?	4	CO2
Q 3	Suggest the importance of draw-works and Blow out preventer in drilling operations.	4	CO2
Q 4	Illustrate and explain the relevant components in drill string.	4	CO1
Q 5	Calculate the True vertical depth in ft. Given that Mud weight=12ppg, Pressure=1000psi	4	CO2

SECTION B

Q 6	Compare Primary & Secondary Cementation processes in detail. Give significance relevance of Squeezing technique? Explain the term high, low pressure squeezing & balance plug method ? Identify all the application of squeezing in cementation. OR Calculate the Drill collar weight in a deviated well of inclination 30degrees. Take the safety factor for the bit to be 50% and it is given the planned mud weight to be 15ppg. Also explain the relation between stress and strain in terms of yield strength.	10	CO4 CO3
Q 7	State the significance of secondary well control. Give the significance of SIDPP, SICP and Pit gain Process? Illustrate different types of kill procedures?	10	CO2
Q 8	Given that a API, 4 inch S-135, Class New drill pipe having minimum yield strength of 125000psi. Calculate the Tensile capacity considering 70% wall thickness?	10	CO2



Q 9

Title: Fall of The Travelling Block
Location: On-land Drilling Location
Loss/ Outcome: Loss of life and equipment damage

BRIEF OF INCIDENT

In the night shift open end drill pipe was run up to desired depth to place repeat cement plug and the well was kept under circulation prior to cement plug job. In the day shift, only four drilling crew reported for duty. Preparation for cement job was underway mean while well was continuously kept under circulation at the same place without any movement of drill string. Installation manager (victim) came to rig floor and asked assistant shift-in-charge, who was working as shift-in-charge and two other drilling crew to go for lunch as after that pulling out of drill pipe was planned after the placement of cement plug. Then Installation manager asked shift driller to reciprocate the string. Shift driller who was working at the brake engaged low clutch and pressed foot peddle, drill string went up to 5 meter and after that suddenly started falling. He disengaged low clutch and applied mechanical brake and at the same time applied auxiliary (disc) brake to stop falling of travelling block, which did not work and mechanical brake was unable to stop movement of free falling travelling block. Victim after seeing this came to help him in applying mechanical brake; they together pressed mechanical brake but were unable to stop. Upper Kelly cock hit Kelly bushing and bell got disengaged from hook, resulting in falling of travelling block on rig floor. Elevator link hit driller console and poles supporting an overhead temporary iron sheet shed. Victim fell down on rig floor and trapped under the iron sheet and travelling block & elevator link. Shift driller also fell on other side but was unhurt. Cementing engineer, who was present on the rig floor raised alarm and rig crew came and first retrieved victim and put him into ambulance. As per eye witness, victim was found in unconscious condition and with very little breath. Ambulance along with the victim reached hospital, where he was declared brought dead.

OBSERVATIONS/ SHORTCOMINGS

Following observations were found during investigative inquiry carried out by visit of the incident site, interaction with the related officials, their written statements thereof and available documents:

- There was no alarm system for low rig air pressure, driller has to inform mechanical crew after seeing the air pressure gauge to start compressor. Loader and unloader valve system is used with compressors to maintain air pressure in normal working range.
- Compressor was running since last three hours and had a history of tripping. No person has gone to see whether this compressor had tripped or running after change-over.

10

CO4

	<p>Mechanical Person who joined after change-over was not sure that compressor had started or tripped. He was also unable to communicate with the committee. Provided for information purpose only. This information should be evaluated to determine if it is applicable in your operations, to avoid recurrence of such incidents.</p> <ul style="list-style-type: none"> → For last three days, low clutch was having problem in engaging and had been reported in the drilling Daily Progress Report. Low clutch problem was rectified and running in was completed in previous shift without any further problem. → It was observed that auxiliary braking system was changed from eddy current braking system to disc brake type without any management of change. The potential risk of using same air power for auxiliary braking system and for emergency braking was not considered. This aspect was not brought into notice by any internal audit or corporate audit done by the company. → Auxiliary braking system was of disc brake type operated with air but it was not built on fail safe principle. → During close examination of accident site, it was observed independent rotary drive system console was fitted on a stand, which was placed behind the driller's position. Thus blocking escape path of driller. → A shed was built overhead of driller's position with supporting pole and iron sheet, under which the victim was trapped. → Management of change procedure was not followed for all the changes as described above. → Only four out of eight drilling crew had reported for duty, which is a matter of concern. One mechanical crew was also overstaying since previous shift. → Person operating the brake at the time of accident was not regularly working on the brake and was observed to be less proficient, he might have taken more time in reacting to the situation. → Frequent problem in working of low clutch and compressor 'A' shows that preventive maintenance of equipment was not adequate. <p>List out the root cause and recommendation for the above mentioned case study?</p>		
SECTION-C			
Q 10	<p>A company ABC desired to increase the density of 700 bbl of 16-lbm/gal mud to 20-lbm/gal. one gallon of water will be added with each 100-lbm sack of API barite to prevent excessive thickening of the mud. A final mud volume of 700 bbl is desired. Evaluate the volume of old mud that should be discarded and the mass of API barite to be added.</p> <p>Reference Table:</p>	20	CO3

Material	Specific gravity	Density	
		lbm/gal	lbm/bbl
attapulgate	2.89	24.1	1011
water	1	8.33	350
diesel	0.86	7.2	300
bentonite clay	2.6	21.7	910
sand	2.63	21.7	910
average drilled solids	2.6	21.7	910
API barite	4.2	35	1470
CaCl ₂	1.96	16.3	686
NaCl	2.16	18	756

Q 11

Illustrate the significance of BOP with respect to shut in procedure. Also explain the role of kill mud in achieving secondary well control taking reference of any one of the three well kill procedures.(take hard shut in procedure as an example).

OR

Formulate the mass of API Barite and the initial volume of the drilling fluid. Given that approximately 1 gallon of water per 100lbm of API barite is usually sufficient to prevent an unacceptable increase in fluid viscosity

Given $V_2 = V_1 + V_b + V_w$, where V_1 is the initial volume V_2 is the final volume, V_b is the volume of API Barite to be added and V_w is the volume fresh water to be added. Calculate the mass of barite and the volume of fresh water to be added.

20

CO4

CO5