Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Dec 2019

Program Name : B.Tech GIE & B.Tech GSE
Semester : V
Course Name : Drilling Engineering and Well Completion
Time : 03 hrs
Course Code : **PEAU2004**
Max. Marks: 100
Nos. of page(s) : Five only
Instructions: *Answer should be precise & to the point.*

SECTION A

S. No.		Marks	CO
Q 1	i. You are the company man on a well being drilled. Well takes a kick. What will be your course of action? Name the steps you will take to kill the well. ii. Explain the procedure to decide casing setting depth. iii. "Wells are designed telescopically", discuss your views to justify it. iv. Compare rotary steering system with mud motor system. v. If a well encounters problems during drilling and due to this problem the approved budget fails, which two decisions should be made?	4 marks each (4x5=20)	CO4 CO1 CO1 CO1 CO4

SECTION B

Q 2	A well was drilled to a depth of 11,500 ft using 11.0 ppg drilling mud. The drillstring has a float valve at the bottom of the string. When new drilling mud was pumped to a depth of 6,500 ft, collapse pressure at the bottom was calculated to be 500 psi. What was the density of the new mud? **OR** A 8 1/ 2" diameter hole is drilled up to 7,500 ft with a density of 12.5 ppg. If the formation pore pressure at this point is 4500 psi. Calculate i) mud pressure overbalance above the pore pressure, ii) if the mud density is 10.5 ppg, what would be the overbalance, and iii) if the fluid level in the annulus is dropped to 250 ft due to inadequate hole fill up during tripping, what would be the effect on bottom-hole pressure?	8 2+2+4=8	CO2

Q 3	List out the various major deflection tools currently used in oil & gas industry for Directional Drilling. Explain in details about any one of them?	3+5=8	CO4
Q 4	What is the objective of well completion? Discuss advantages and disadvantages of both Open Hole and Cased Hole completion.	3+=8	CO1
Q 5	A drilling engineer wants to prepare a drilling mud of volume of 5,550 cubic feet using water and Bentonite of 2.43 gm/cc density. The required final weight was calculated to be 9.5 ppg. Calculate the amount of Bentonite to be mixed in tons and the volume of water to be used in barrels. **OR** Draw a neat flow diagram of Mud Circulation System. Briefly explain the function of any five component available on this system.	4+4=8 3+5=8	CO2
Q 6	A bladder type accumulator bottle of 11 gallons capacity was pre-charged with Nitrogen gas at pressure of 1000Psi. The hydraulic fluid is pumped to its rated pressure of 3000 Psi. This Hydraulic fluid of bottle was used to operate BOP function. The pressure of the bottle has dropped to 1250 psi. The volume of bladder and puppet assembly in the accumulator bottle is one gallon. Calculate how much fluid has been used to operate the BOP functions?	8	CO2
SECTION-C			
Q 7	The hoisting system of a rig derrick has a load of 350,000 lbf. The input power of the drawworks for the rig can be a maximum of 530 hp. Eight drilling lines are strung between the crown block and traveling block. Assume that the rig floor is arranged as shown in Figure 2.3. Consider there is some loss of power due to friction within the hoisting system. Compute (1) the static tension in the fast line when upward motion is impending, (2) the mechanical advantage of the block and tackle, (3) the maximum hook horsepower available, (4) the maximum hoisting speed, (5) if a 90 ft stand is required to be pulled, what should be the required time, (6) the actual derrick load, (7) the maximum equivalent derrick load, and (8) the derrick efficiency factor. **OR** (a) A production casing was planned to be set in the well with drilling mud of 9.8 ppg at the annulus. When inside casing was filled with cement slurry of 15.8 ppg mud, burst safety factor was calculated to be 2.50. When cement slurry displaced and filled the annulus, mud weight of the drilling fluid inside the casing was 9.8 ppg. Collapse safety factor was calculated to be 2.27 when cement slurry was totally filled the annulus. Determine the ratio between burst and collapse ratings of the casing. In addition, if the burst rating of the casing is 11,300 psi, calculate collapse resistance of the casing and the casing setting depth.	2.5x8=20 4+4+4=12 4+4=8	CO2

	(b) What do you understand by the term "The Authorization for Expenditure (AFE)". Also discuss the key factors which affect the drilling costs.			
Q8	Original mud weight Measured depth Kill rate pressure @ 50 spm **Drill string**: drill pipe 5.0 in. — 19.5 lb/ft capacity HWDP 5.0 in. 49.3 lb/ft capacity length **drill collars** 8.0 in. OD — 3.0 in. ID capacity length **Annulus:** hole size drill collar/open hole capacity drill pipe/open hole capacity drill pipe/casing capacity Mud pump (7 in. x 12 in. triplex @ 95% eff.) Leak-off test with 9,0 ppg mud Casing setting depth Shut-in drill pipe pressure Shut-in casing pressure Pit volume gain True vertical depth	= 9.6 ppg = 10,525 ft = 1000 psi = 0.01776 bbl/ft = 0.00883 bbl/ft = 250 ft = 0.0087 bbl/ft = 350 ft = 12 1/4 in. = 0.0836 bbl/ft = 0.1215 bbl/ft = 0.1303 bbl/ft = 0.136 bbl/stk = 1130 psi = 4000 ft = 450 psi = 550 psi = 40 bbl = 10,000 ft	2x10=20	CO3
	Use the above data to answer the following questions. (A) SURFACE TO BIT STROKES ---------- (B) BIT TO SHOE STROKES ---------- (C) BIT TO SURFACE VOLUME ---------- (D) KILL MUD WEIGHT ---------- (E) INITIAL CIRCULATING PRESSURE ---------- (F) FINAL CIRCULATING PRESSURE ---------- (G) MAASP WITH CURRENT MUD WEIGHT ---------- (H) MAASP AFTER CIRCULATING KILL MUD ---------- (I) TIME FOR COMPLETE ONE CIRCULATION ---------- (J) PRESSURE DROP PER 100 STROKES ----------			

Please detach the Kill Sheet from the question paper, fill it up & tie it with the answer sheet.

Surface BOP (Vertical Well) Kill Sheet	API Field Unit

Formation Strength Data:

Surface Leak-off Pressure	(A)	psi
Mud Weight	(B)	ppg

Maximum Allowable Mud Weight

$$(B) + \frac{(A)}{\text{Shoe True Vertical Depth} \times 0.052}$$

(C) ppg

Initial MAASP

{(C) –Current Mud Weight} x Shoe TVD x 0.052 =

psi

Pump No.1 Displacement	Pump No.2 Displacement
bbls /stroke	bbls / stroke

Slow Pump Rate Data	Dynamic Pressure Loss (PL) Pump No. 1	Pump No. 2
Spm		
Spm		

Current Well Data :

Mud data:

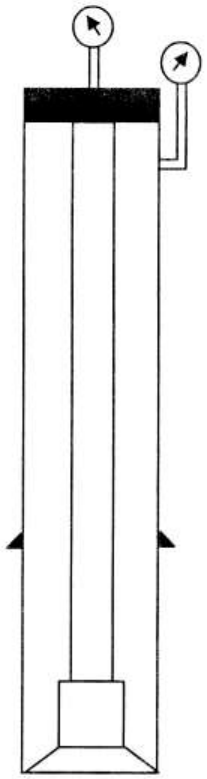
Mud Weight ppg

Casing Shoe Data:

Size	in.
M.D.	ft.
T.V.D.	ft.

Hole Data:

Size	in.
M.D.	ft.
T.V.D.	ft.



Pre-Volume Data:	Length Ft.	Capacity Bbls/ft.	Volume Bbls	Pump Strokes	Time minutes
Drill Pipe	x	=		Volume / Pump Displacement	Pump Strokes / Slow Pump Rate
Heavy Wall Drill Pipe	x	=			
Drill Collars	x	=			
Drill String Volume		**(D)** bbl		**(E)** stks	min

DC x Open Hole	x	=			
DP/HWDP x Open Hole	x	=			
Open Hole Volume		**(F)** bbl		stks	min

DP x Casing	x	=	**(G)** bbl	stks	min

Total Annulus Volume	(F +G) = (H) bbl	stks	min
Total Well System Volume	(D+H) = (I) bbl	stks	min

Kick Data					
SIDPP		psi	SICP		psi	Pit Gain		bbls

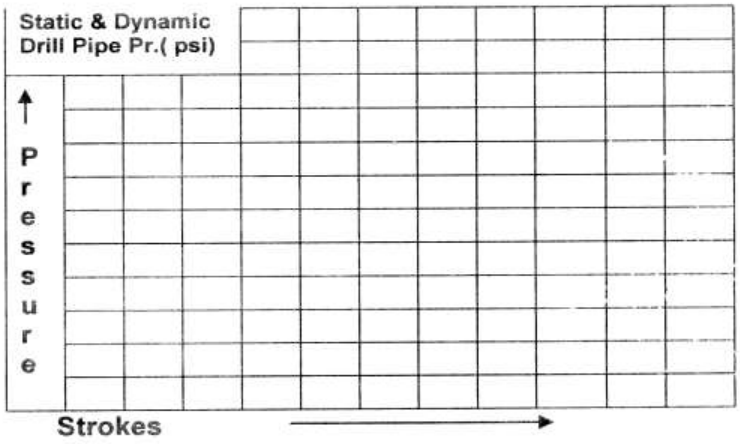
Kill Mud Weight **KMW**	Current Mud Weight + $\frac{\text{SIDPP}}{\text{TVD X 0.052}}$	= ppg

Initial Circulating Pressure **ICP**	Dynamic Pressure Loss + SIDPP	= psi

Final Circulating Pressure **FCP**	$\frac{\text{Kill Mud Weight}}{\text{Current Mud Weight}}$ x Dynamic Pressure Loss	= psi

(K) = ICP – FCP = = psi	$\frac{(K) \times 100}{(E)}$ = psi / 100 strokes

Strokes	Pressure



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