

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: B.Tech GSE&GIE
Program: Geomechanics
Time: 03 hrs.
No of pages:3
Instructions:

Semester: VI

Max. Marks: 100

SECTION A

S. No.		Marks	CO
Q 1	Give required inputs for Geomechanical analysis	4	CO4
Q2	Give steps for carrying out Geomechanical analysis What is the contribution of Kirsch?	3+1	CO4
Q3	If formation pressure is Hydrostatic + 15%, what will be mud weight required to drill at 6000 feet	4	CO3
Q4	What are the effects and consequences of depletion.	3+1	CO2
Q5	A leak off test was carried out just below 9-5/8" casing shoe (set at 8000feet). with 12.0 ppg mud. Leak off test took place at a surface pressure of 800 psi. Calculate fracture pressure, fracture gradient and fracture mud weight	4	CO1

SECTION B

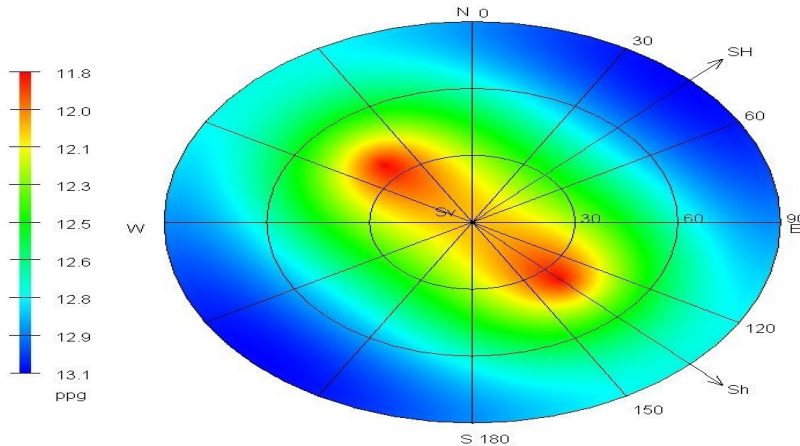
Q6	a)What is ECD? Is it different from static mud density? What borehole problems are faced when effect of ECD is ignored? Describe in detail. b) Depth (TVD); 15000 feet; Mud weight: 15 ppg When circulating , the annular pressure loss is 500 psi Calculate bottom hole circulating pressure and equivalent circulating density (ECD)	5+5	CO4
Q7	a) What is Stress anisotropy? b) Describe different stress regimes in view of stress anisotropy. c) How a stable well path is chosen for drilling in different stress regimes? Explain giving reasons behind it.	2+3+5	CO2
Q8	a)What is Effective Stress? Explain with Terzaghi equation. Does it change with Pore Pressure? b)What is the effect on Mohr's circle if pore pressure is increased? c)Describe Biot constant	4+3+3	CO1
Q9	a)What are LOT and XLOT? Describe in detail with neatly sketched curve.Highlight which technical information is obtained from the test? b) Which type of failure a rock is subjected to, in LOT? c)Explain with reason fracture orientation when LOT is done.	7+1+2	CO1
OR Q9A	a)Describe Hubbert and Willis Method for determination of fracture gradient. How maximum and minimum value of fracture gradient is calculated. Describe main disadvantage of this method. b)Assuming formation pore pressure at 5000 feet is 2400 psi, overburden stress	4+3+3	CO1

gradient is 1 psi/foot and poisson's ratio as 0.25, calculate max/min fracture gradient by Hubbert-Willis method as well as with Eaton method. Compare the result.

SECTION-C

Q 10

a)



- i. What this plot is called?
- ii. Give detailed feature of plot.
- iii. Purpose of its use.
- iv. Give the azimuth of σ_H and σ_h
- v. What will be the mud weight at inclination 30° and azimuth N150 $^\circ$.

b) An element in plane stress is subjected to stresses $\sigma_x = 100$ MPa, $\sigma_y = 80$ MPa and $\tau_{xy} = 28$ MPa. Determine stresses acting on an element oriented at an angle $\theta = 30^\circ$ counter clockwise.

10

CO4

CO1

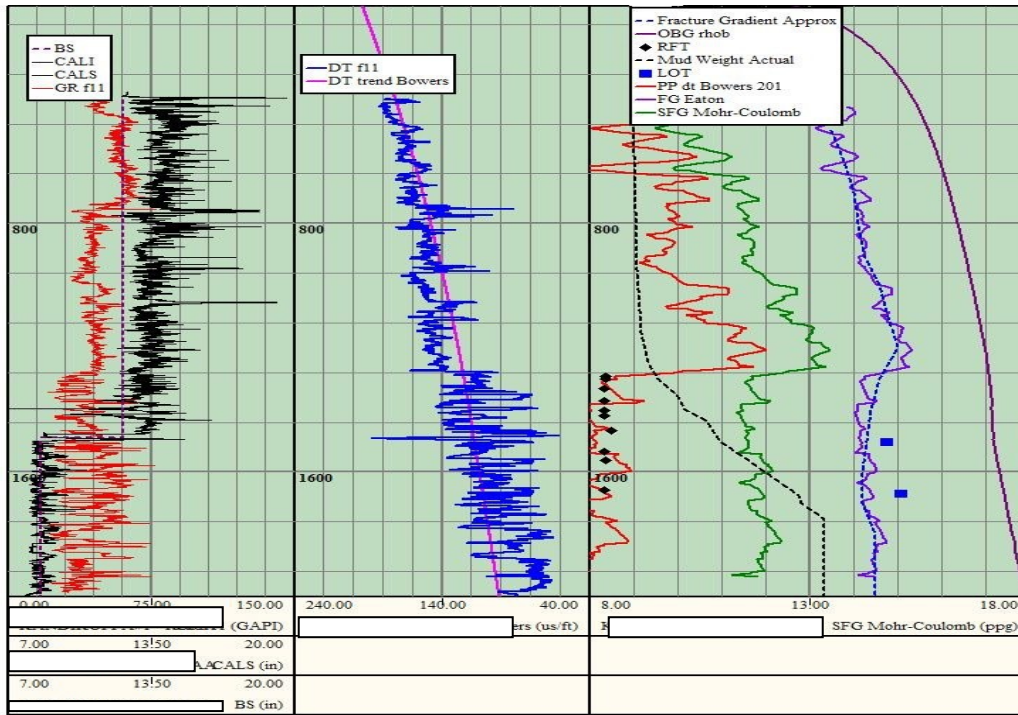
10

11

- a) Post drill geomechanical analysis of a well in 12-1/4" and 8-1/2" phase was carried out, results of which are given below. Answer the following
- i. How many tracks are given?
 - ii. Write down names of given curves trackwise
 - iii. Give the functions of each curve
 - iv. In which track, mud weight window is given
 - v. Analyse mud weight window and write down the problems likely to be encountered during drilling.
 - vi. Give supporting evidence for the encountered problems
 - vii. Is it a 1D or 3D or 4D Geomechanical analysis? Comment.

15

CO4



b) From the ideal stress state, the breakdown pressure P_b was observed to be 8620 psi and minimum horizontal stress σ_{hmin} was measured to be 8225 psi. Other parameters are Pore pressure $P_p = 6800$ psi; Vertical stress $\sigma_V = 8465$ psi; Biot's constant is 1; Poisson's ratio $\nu = 0.229$; Tensile strength = 215 psi. Determine maximum horizontal stress.

5

OR
Q11a

- What are the different approaches for ensuring wellbore stability? Describe in detail.
- What are the different types of mud systems used for well bore stability? How highly inhibited mud system helps in reducing pressure overbalance?
- How does K^+ ions ensure excellent inhibition?
- Depth (TVD); 8000 feet; Mud weight: 10 ppg; Formation pressure gradient: 0.61psi/feet; Is the well Underbalance or Overbalance?

7+7+2
+4

CO2