

Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination (Dec 2021)

Program: B. Tech APE-UP	Semester: VII
Course: Geomechanics	Time: 180 minute (3 hours)
Course Code: PEAU3003	Max. Marks: 100
Number of pages: 03	

SECTION A

- Each question carries 4 points **5 question X 4 points = 20**
- Answer all questions in sequence. If you do not know the answer, leave a space with question number written
- Answer is five or less sentences where required

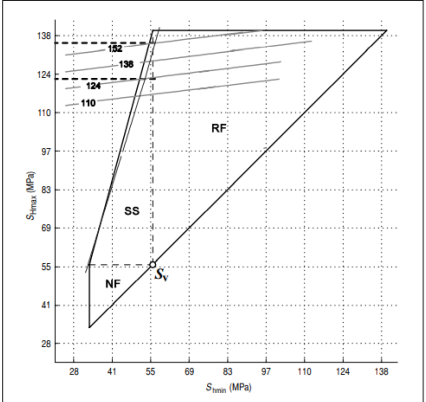
Q.No	Question	CO
1.	State four parameters on which aperture of an unpropped hydraulic fracture depends during hydraulic fracturing.	CO1
2.	State reservoir/geologic conditions that would result in a complex hydraulic fracture network vs. a simple hydraulic fracture network.	CO1
3.	State the major difference between PKN (Perkins-Kern-Nordgren) and KGD (Khristianovic-Geertsma-de Klerk) models? Which one is more likely to be accurate in case of hydraulic fracturing in horizontally-bedded shales?	CO2
4.	State reasons for the minor variability of breakout/tensile fracture azimuthal positions and sizes along the length of a vertical wellbore.	CO2
5.	Enumerate the pressure points observed during a minifrac test. Which points can be considered the upper and lower limits for S3 (least principal stress)?	CO3

SECTION B

- Each question carries 10 points **4 question X 10 points = 40**
- Answer in 10 or less sentences
- Drawing diagrams allowed wherever you see fit
- Answer all questions in sequence. If you do not know the answer, leave a space with question number written

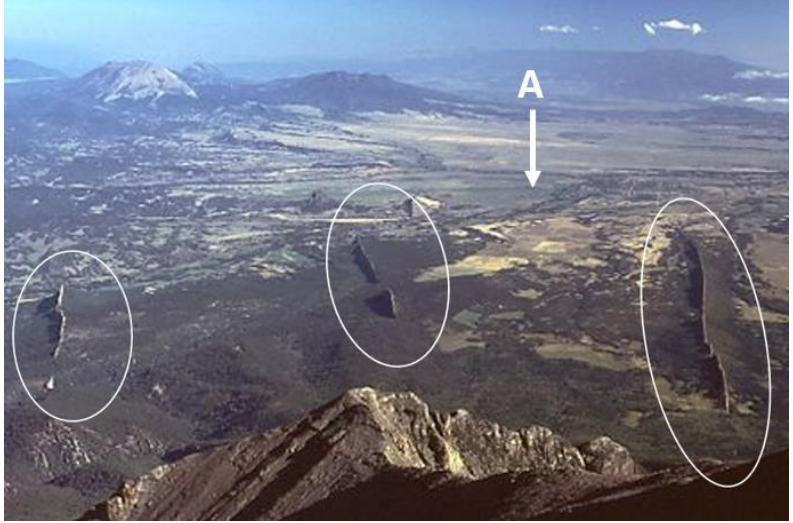
Q.No	Question	CO

1. Explain why proppant does not reach the hydraulic fracture tips? Mention the steps you can take to pump proppant as deep as possible during hydraulic fracturing. CO3

2.  Interpret the diagram and answer the following questions:

A) For a strike-slip faulting regime and measured S_{Hmin} of 41 MPa, what is the possible range of values for S_{Hmax} .

B) For a reverse-faulting stress regime, a measured 97 MPa S_{Hmin} , and measured 124 MPa UCS rock, what is the possible S_{Hmax} value range?

3.  The dykes (in white circles) are oriented (striking) in approximately NW-SE direction. Assume the stress orientations have not changed since the dykes came into existence. Also, assume that stress regime and orientation stay the same at depth and regionally. It is known that S_v is higher than S_{Hmax} , and S_{Hmin} is lower than S_{Hmax} in this area. A well now needs to be drilled at location A to a depth of 5000 ft. You can drill the well vertically, or horizontally in any direction. After analyzing the photograph and answer the following questions: CO5

	<p>A) In which direction/inclination would you drill for reducing the possibilities of tensile fracture initiations or breakouts initiations? Explain your decisions as briefly as possible.</p> <p>B) Suppose Mr. Brown drilled a vertical well at point A and breakouts were observed along the wellbore, in what approximate direction would you observe those breakouts? Provide your reasoning as briefly as possible.</p>	
4.	<p>Describe the steps required for production modeling from hydraulic fractures (12 or less sentences or bullet points).</p> <p>OR</p> <p>Explain how you can increase hydrocarbon production without excessive sand production (12 or less sentences or bullet points).</p>	CO3

SECTION C

- Each question carries 20 points 2 question X 20 points = 40
- Drawing diagrams allowed wherever you see fit
- Answer all questions in sequence. If you do not know the answer, leave a space with question number written

Q.No	Question	CO
1.	<p>Given $S_{Hmax} > S_v > S_{Hmin}$, a near horizontal well was being drilled in the NE direction, and breakouts were observed on the wellbore sides (not top and bottom). A) Interpret the likely direction of the maximum principal horizontal stress? B) If in the same stress regime, a highly deviated well was being drilling in the SE direction, where (sides or top-bottom) would you expect the breakouts to form?</p>	CO5
2.	<p>A) Illustrate in detail how microseismic event location and timing is determined.</p> <p>B) Discuss what the cumulative seismic moment comparison between different hydraulic fracturing stages indicate.</p> <p>C) State whether different stages of a hydraulic fracturing job performed from toe-to-hill or hill-to-toe of a horizontal well.</p> <p>OR</p> <p>A) Illustrate in detail the laboratory process of building anisotropic geomechanical models.</p> <p>B) Explain the three different parameters that quantify anisotropy in this process.</p> <p>C) Discuss which rock types are likely to require these models and why?</p> <p>D) List situations where these models are generally used</p>	CO4