UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B. Tech (APE – GAS) **Semester – 5th**
Subject (Course): Production Engineering **Max. Marks: 100**
Course Code : PTEG328 **Duration : 3 Hrs.**
No. of page/s: 4

SECTION A (5 x 4 = 20 marks)

1. Define "scale" and state the causes for scale deposition: -

2. (a) A sucker rod pump unit is designated by C-228D-200-74. What does '228' & '200' represents here?

   (b) State the type of pump normally used in surface production facilities: -

3. State whether the below mentioned statements are true or false: -

   (a) In a gas lift technique low power is required if we inject gas at high pressure & low rate.
   (b) On acidization of sandstone reservoir 'wormholes' are formed upon acid reaction with formation.

4. State the mechanical and chemical methods for 'acid diversion' to perform optimized matrix acidization of the formation: -

5. Calculate the kill fluid density required for performing workover operations under following conditions:

   Perforations at 11600 ft. (TVD)
   Shut in tubing pressure = 3950 psi
   Specific gravity of oil = 0.69 (oil present in tubing)

SECTION B (4x 10 = 40 marks)

6. For a well polished rod, stroke length is 68 in., pumping speed is 16 spm, and length of the sucker rod string is 6898 ft. What would be the increase in effective plunger stroke if pumping speed were increased to 20 spm? (take Modulus of elasticity of steel as 30×10^6 psi)

7. (a) Calculate the total dynamic head for an electrical submersible pump to be used for a well to produce 2000 STB/day of oil assuming that water cut is zero in the well. Following data are available:
Well depth (perforation level) = 2200 ft.
Static fluid level (from the surface) = 500 ft.
Productivity Index of well = 4 bbl/day/psia
Wellhead pressure = 150 psia
Tubing frictional losses = 18.5ft per 1000ft of the lift
Specific gravity of oil = 0.85 (5 marks)

(b) What is the Tubing Head Pressure of a well, completed with 8000 ft of 2.375 in. tubing, which is flowing at 600 bbl/day and GLR of 0.4 mcf/bbl if the bottom of the tubing is 2200 psi? Gilbert chart is attached in the question paper (5 marks)

8. (a) Discuss gas coning production problem with special reference to its cause, dynamics, and remedy methods. Also state which well (horizontal or vertical) have relatively high coning tendency with reason: - (7 marks)

(b) Discuss the basis of Ross correlation for vertical lift performance: - (3 marks)

9. Explain Nodal Analysis of oil and gas well with operating principle. Perform nodal analysis for an oil well using wellhead node as solution node: -

SECTION C (2x 20 = 40 marks)

10. (a) Given the formation sand sieve analysis data from Schwartz graph.

$D_{f40} = 0.122$ mm ; $D_{f50} = 0.117$ mm; $D_{f90} = 0.086$ mm

Select the proper gravel size (i.e. gravel diameter) for a well that is expected to produce at a rate such that fluid velocity through half of open screen area is about 0.02 m/sec: -

(8 marks)

(b) Briefly explain the procedure of determining the depth of perforations: - (5 marks)

(c) In Lakhwa oilfield a well is placed on gas lift. Casing pressure operated valve is used. The operating valve is located at 6000 ft. The pressure in bellow is 700 psi and tubing

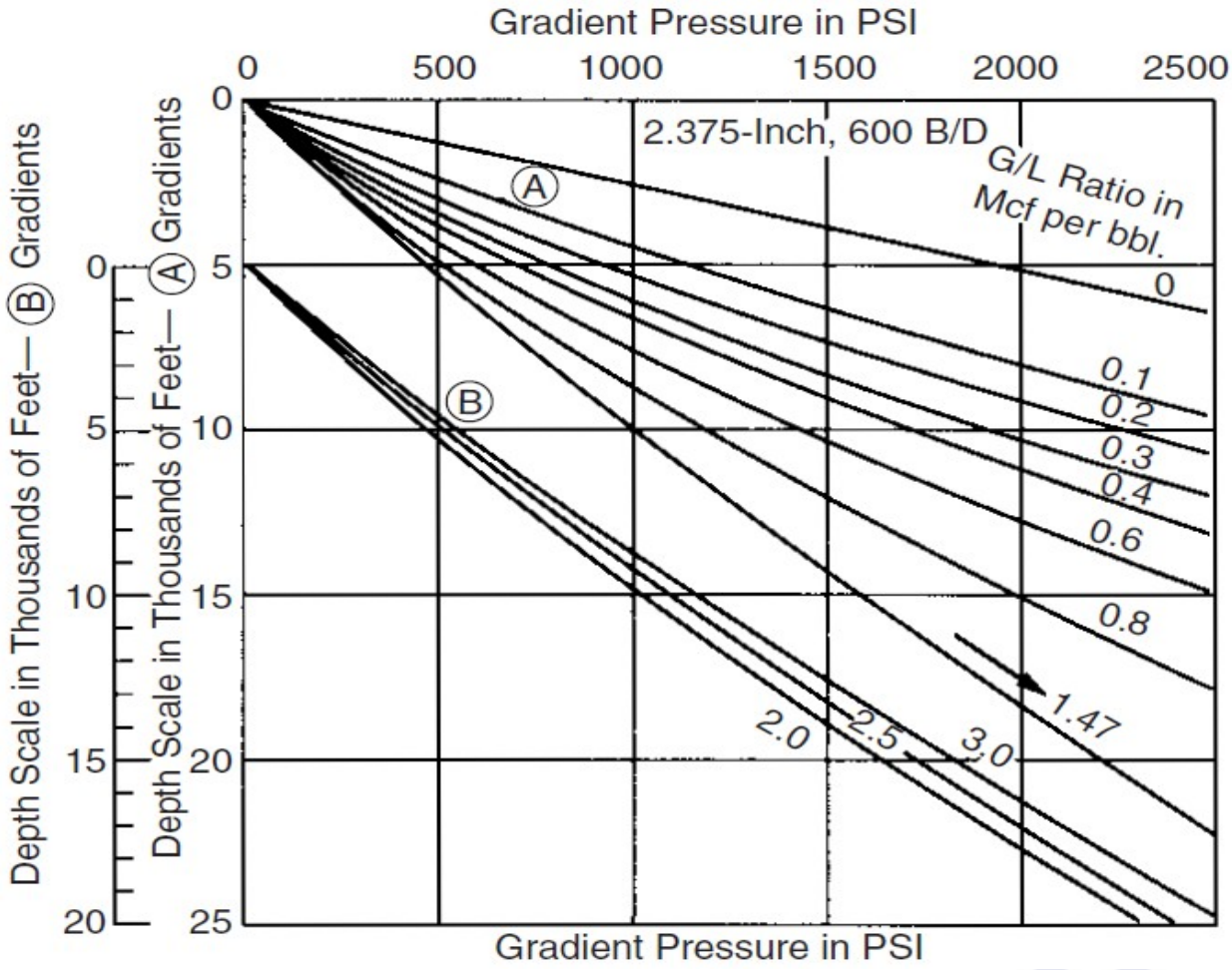
pressure is 500 psi at 6000 ft. Area of below and port is 1 in^2 & 0.1 in^2 respectively. Bellow pressure at 60˚F is 590 psi. Find: -

i. Casing pressure at valve depth required to open the valve
ii. Valve spread
iii. Test rack opening pressure of the valve (7 marks)

11. (a) A sandstone with a porosity of 25 % containing 12 vol.% calcite (CaCO3) is to be acidized with HF/HCl mixture solution. A preflush of 18 wt% HCl solution is to be injected ahead of the mixture to dissolve the carbonate minerals and establish a low pH environment. If the HCl preflush is to remove all carbonates in a region within 1 ft beyond a 0.328-ft radius wellbore before the HF/HCl stage enters the formation, what minimum preflush volume is required in terms of gallon per foot of pay zone?
Following data is given:
Molecular weight of calcite = 100.1 lb/mol
Molecular weight of HCl = 36.5 lb/mol
Density of calcite = 169 lb/ft^3
Specific gravity of HCl = 1.07 (10 marks)

(b) State the probable sources of excessive water production (as a problem) in oil & gas wells. Also state why water cut is undesirable? Elaborate water shut off measures normally carried out: - (10 marks)

****


Gradient Pressure in PSI
0
500
1000
1500
2000
2500
2.375-Inch, 600 B/D
G/L Ratio in Mcf per bbl.
0
0.1
0.2
0.3
0.4
0.6
0.8
1.47
2.0
2.5
3.0
A
B
Depth Scale in Thousands of Feet— (A) Gradients
0
5
10
15
20
25
Depth Scale in Thousands of Feet— (B) Gradients
0
5
10
15
20
Gradient Pressure in PSI