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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, October, 2017

Program: B.Tech (CSE) (Splz: Oil & Gas Informatics) **Semester – 7th**

Course Name : Production Engineering **Maximum Marks: 100**
Course Code : PTEG324 **Duration: 3 Hrs**
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SECTION A (5 x 4 = 20 marks)

1. Explain the following terms: -

   a) Production tubing
   b) Packer

2. State the expression for critical pressure ratio through choke with standard symbols: -

3. Explain about "wellhead" equipment used in production operations and its function: -

4. Elaborate about "formation damage" of the producing zone: -

5. Explain the flowing properties: -

   a) "Sonic flow" through choke
   b) Three principle insitu rock stresses

SECTION B (4x 10 = 40 marks)

6. A 0.6 specific gravity gas flows from a 2-in. pipe through a 1-in. orifice-type choke. The upstream pressure and temperature are 800 psia and 75 8F, respectively. The downstream pressure is 200 psia (measured 2 ft. from the orifice). The gas-specific heat ratio is 1.3

   (a) Does heating need to be applied to ensure that the frost does not clog the orifice? Justify your answer accordingly
   (b) What is the expected pressure at the orifice outlet?

7. Explain the need and process of hydraulic fracturing. What are the properties of fracturing fluid and additives added to the fracturing fluid?

8. In Amiteshwar oilfield a well has a wellbore radius of 0.328 ft. and a penetration of damage of 3 ft. beyond the well. What would be the skin effect if the permeability impairment results in $\frac{k}{kskin}$ =5. What inference you deduce about well production performance from calculated value of skin?

9. An oilfield is drilled on a cylindrical 80-acre spacing. The reservoir pressure is 1000 psi. Permeability of rock matrix is 50 mD; The height of reservoir is 20 ft.; oil viscosity is 3 cP; oil formation volume factor is 1.25bbl/STB. The wells are completed with 7-inch casing. What is production rate per well when the producing pressure at the bottom of the well is 500 psi? (use pseudo steady state equation for oil reservoir to solve the question)

SECTION C (2x 20 = 40 marks)

10. (a) Sandstone at a depth of 10,000 ft has a Poison's ratio of 0.25 and a poro-elastic constant of 0.72. The average density of the overburden formation is 165 lb/ft^3. The reservoir pressure is 3800 psi. Assuming a tectonic stress of 2,000 psi and a tensile strength of the sandstone of 1,000 psi, predict the breakdown pressure for the sandstone while performing hydraulic fracturing: - (10 marks)

(b) Explain the process of matrix acidization & acid fracturing of sandstone and carbonate reservoirs: - (10 marks)

11. A sandstone with a porosity of 20 % containing 10 vol.% calcite (CaCO3) is to be acidized with HF/HCl mixture solution. A preflush of 15 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