UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May, 2018

Program/course: B.Tech APE Gas	Semester – VI
Subject: Well logging and Well Testing	Max. Marks : 100
Code : PTEG 327	Duration : 3 Hrs
No. of page/s: 05	

SECTION A: Answer all the questions.   **[5*4 =20 marks]**

1. Explain principle of neutron log? What does neutron log measures?
2. Describe different ways in which gamma ray can interact with matter??
3. What does PE log indicate? Calculate the PE value for limestone matrix.
4. Differentiate between the two responses A and B shown for a CBL and VDL log
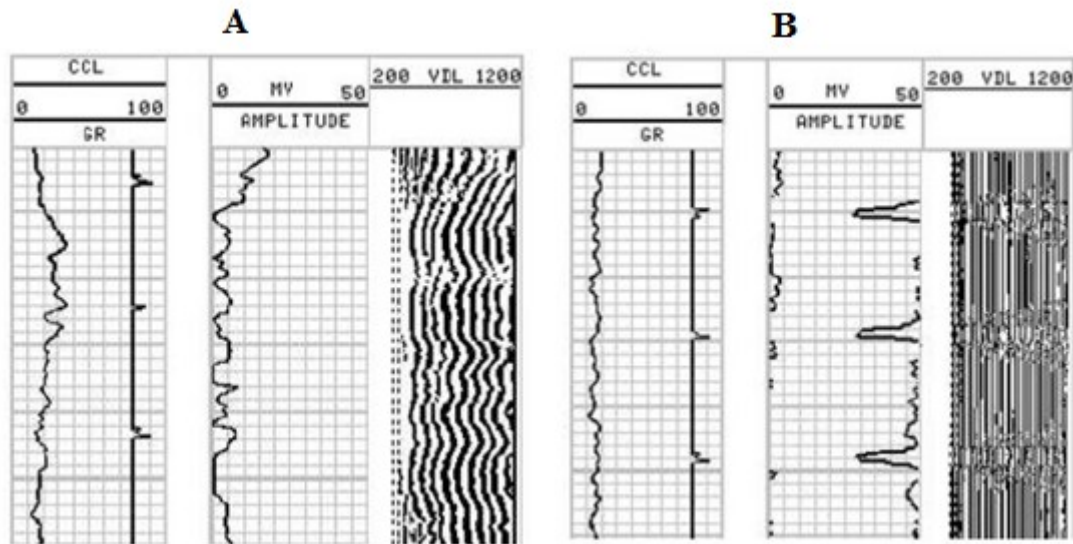
5. Briefly explain how the combination of neutron and density log can help in identifying a hydrocarbon gas zone?

SECTION B: Answer all the questions.   **[4*10=40 marks]**

6. Explain the principle and working of NMR log and discuss how permeability is determined from the NMR log? [10]

7. From the given well log data identify Gas-oil contact (GOC), Oil-water contact (OWC). Evaluate shale volume, porosity from density log, corrected porosity, water saturation and hydrocarbon saturation at a depth 7200 ft. (Given Resistivity of formation water is 0.1 ohm m) [Attach the interpreted well logs along with the answer sheet] [10]

8. a. Describe the principle and working of sonic log. [04]

   b. Evaluate the porosity of sandstone formation, if the interval transit times of the formation, matrix and fluid are 70 μs, 55 μs and 190 μs respectively? [03]

   c. What will be S-wave velocity of a medium having a Poisson's ratio and a P-wave velocity of 0.5 and 3 km/s respectively? [03]

9. a. Explain the principle and working of bulk density log? [04]

   b. What is the use of spine and rib chart in bulk density log? [02]

   c. What will be the bulk density of a limestone reservoir fully saturated with freshwater and having porosity 20%. [02]

   d. Match the items of **Group I** with those of **Group II** [02]

Group I	**Group II**
P) Caliper log	1) Permeability
Q) NMR log	2) Resistivity
R) Neutron log	3) Diameter
S) SP log	4) Velocity
	5) Porosity

**SECTION C:** **Answer all the questions.**   **[20*2= 40 marks]**

10. a. Explain the following types of well testing techniques: [10 marks]
    i.   Pressure drawdown test
    ii.   Injection well test

    b. Explain the analysis of Pressure buildup test. Also state the Horner equation and its significance with a suitable diagram: -   [10 marks]

11. a. The following data are given for an oil well that is scheduled for a drawdown test:
    - Volume of fluid in the wellbore = 180 bbls
    - Tubing outside diameter = 2 inches
    - Production casing inside diameter = 7.675 inches
    - Average oil density in the wellbore = 45 lb/ft3
    - h = 20 ft   φ = 15% r_w = 0.25 ft
    - μo = 2 cP   k = 30 mD   s = 0
    - Total compressibility = 20×10^{-6} psi^{-1}
    - Oil compressibility = 10×10^{-6} psi^{-1}

If this well is placed under a constant production rate, how long will it take for wellbore storage effects to end?   [10 marks]

b. Given a reservoir with the following properties undergoing step rate injection test: -

- Water viscosity = 0.45 cP
- Water formation volume factor = 1.0 RB/STB
- Porosity = 0. 186
- total compressibility = 1.5 x 10-5 psi^{-1}
- wellbore radius = 0.25 ft
- total Depth = 7,260 ft
- Injected-fluid pressure gradient = 0.433 psi/ft

Determine the fracture gradient of the formation. [05 marks]
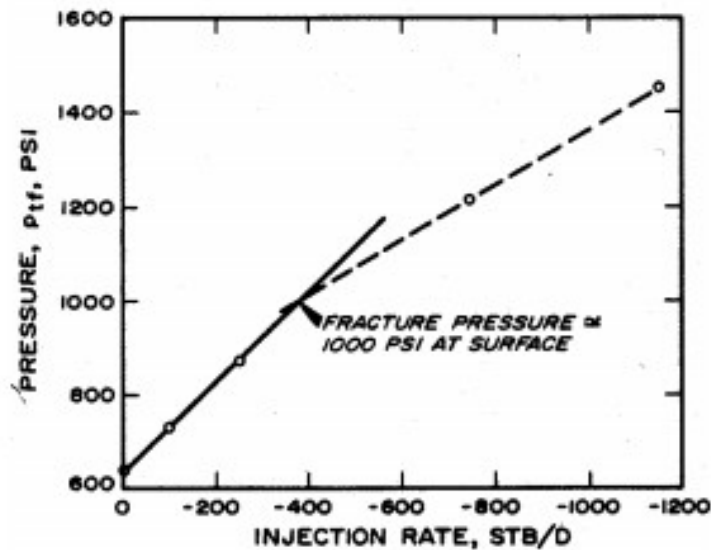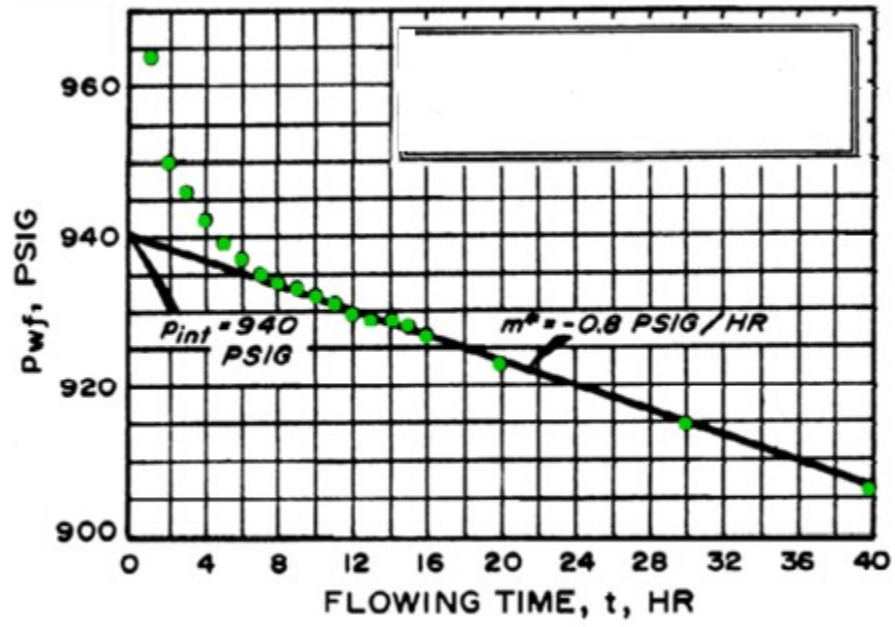

Step rate injectivity test
Earlougher (1977)

c. Use the long time Pressure drawdown test data given below to estimate the original oil in place of the well:

- Oil flow rate = 348 bbl/day
- Total compressibility = 8.74 x 10^{-6} psi^{-1}
- Oil formation volume factor = 1.14 rB/STB
- Rock porosity = 20 %
- Payzone thickness = 130 ft
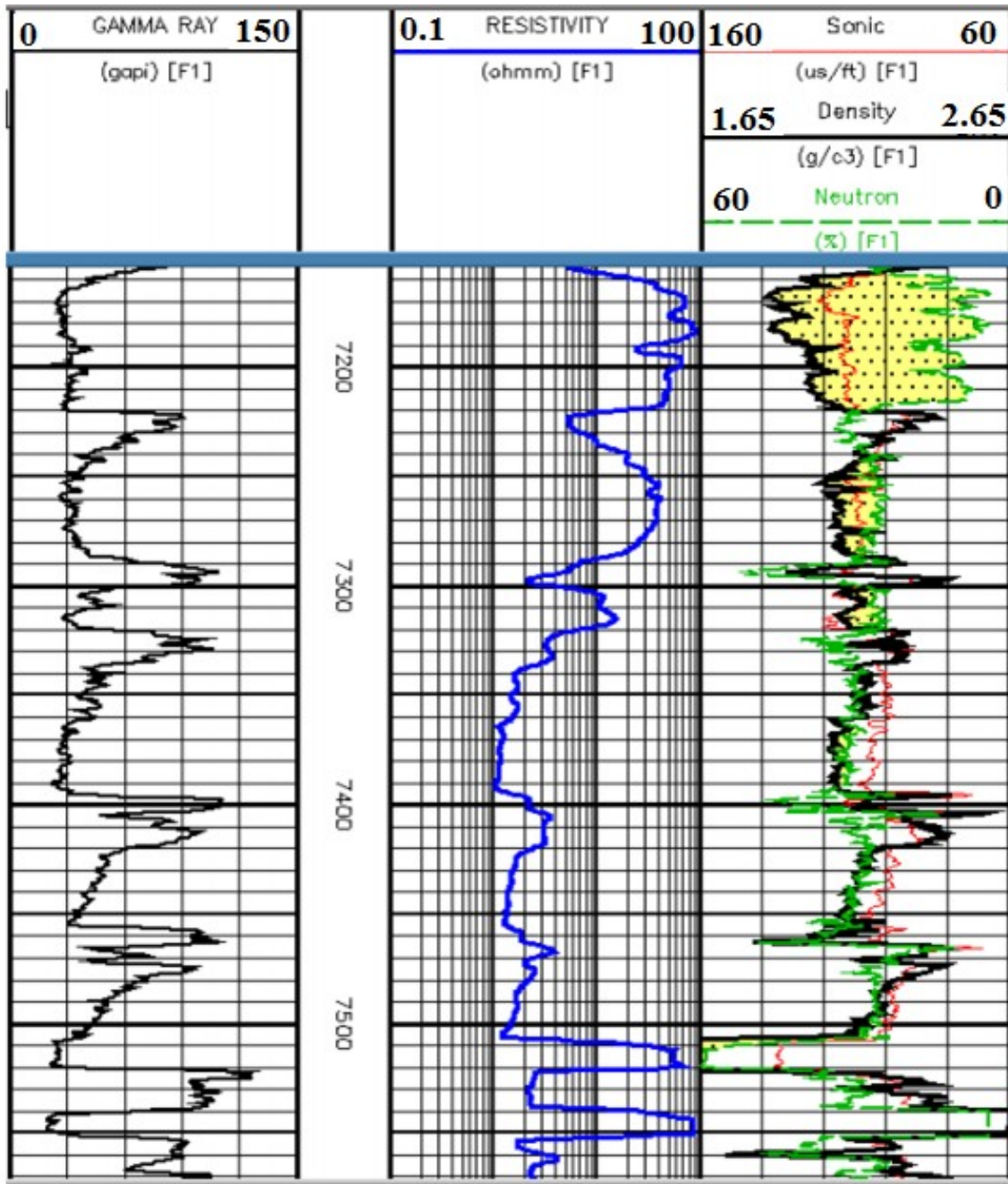
- Water Saturation = 0.2   [05 marks]

Fig : Ques 7