Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

END Semester Examination, July 2020

Programme Name: B.Tech., APE GAS **Semester** : **VI**

Course Name : Well Logging Analysis and Well Testing **Time** : **3 hrs**

Course Code : PEAU 3015 **Max. Marks : 100**

Nos. of page(s) : **1**

Instructions: 1. The answers are to be hand written on a paper, scanned (or snapshot) and uploaded (as single file) in the submission link on blackboard platform only.

2. Write Name, Roll Number and Page Numbers on all pages. Write Roll Number as file name.

3. The online test is open book based exam.

SNo	Question	Marks	CO
Q 1	Demonstrate with neat diagram the working principle of Induction log.	**15**	**CO1**
Q 2	Illustrate with neat diagram the functional components of Drill Stem Testing (DST) tool.	**15**	**CO2**
Q 3	(see below)	**10+25**	**CO3**
Q 4	(see below)	**35**	**CO4**

Q 3

a. Derive for pressure transient expression for multi-rate flow test in infinite-acting reservoirs for slightly compressible liquids.

b. Production rate during a 48-hours drawdown test declined from 1580 to 983stb/day. Rate and pressure data appear in Table below. Reservoir, PVT, and rock data are: P_i = 2906 psi, μ_o = 0.6 cP, β_o = 1.270 rb/stb, h = 40 ft, Φ = 12%, C_t = 17.5 x 10^{-6}, and r_w = 0.29 ft. Estimate the permeability, k and skin factor, S.

Time (hr)	Flow Rate (stb/day)	Tubing Pressure (psig)	Time (hr)	Flow Rate (stb/day)	Tubing Pressure (psig)	Time (hr)	Flow Rate (stb/day)	Tubing Pressure (psig)
1	1580	2023	6.55	1440	1834	19.2	1160	1771
1.5	1580	1968	7	1440	1830	20	1160	1772
1.89	1580	1941	7.2	1440	1830	21.6	1137	1772
2.4	1580	1941	7.5	1370	1827	24	1106	1756
3	1580	1892	8.95	1370	1821	28.8	1106	1756
3.45	1490	1882	9.6	1370	1821	30	1080	1751
3.98	1490	1873	10	1300	1815	33.6	1080	1751
4.5	1490	1867	12	1300	1797	36	1000	1751
4.8	1490	1867	14.4	1190	1797	36.2	983	1756
5.5	1490	1853	15	1190	1775	48	983	1743
6.05	1440	1843	18	1190	1771	-	-	-

Q 4

Deduce the pressure transient equation for flow of compressible gases through porous medium from the following diffusivity equation developed using the pressure-squared approach given by,

$$\frac{\partial^2 p^2}{\partial r^2} + \frac{1}{r}\frac{\partial p^2}{\partial r} = \frac{\phi \bar{\mu}_g}{kp}\frac{\partial p^2}{\partial t}$$

a. With the reservoir initially at constant pressure, i.e., $p^2 = p_r^2$ (∂+t=0) for $r_w \le r \le r_e$

b. The wellbore boundary condition is

$$r\frac{\partial p^2}{\partial r}\bigg|_{well} = \frac{q\mu_g p}{\pi kh} = \frac{q_{sc}\bar{\mu}_g}{\pi kh}\,\frac{p_{sc} T_R \bar{z}}{T_{sc}} \quad \text{for } t > 0;\ \partial + r = r_w$$

c. The pressure at the outer boundary (radius = infinity) is the same as the initial pressure for t > 0, i,e., $p^2 \rightarrow p_r^2$ as $r \rightarrow \infty$ for $t \ge 0$.