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UNIVERSITY OF PETROLEUM & ENERGY STUDIES

DEHRADUN

End Semester Examination – December 2017

Program/course: APEV Upstream | **Semester – V**
Subject: Production Engineering I | **Max. Marks : 100**
Code : PTEG 321 | **Duration : 3 Hrs**
No. of pages: 2

Please read the question and instructions carefully and give precise answers

SECTION A **Marks 20(4*5)**

ALL QUESTIONS ARE COMPULSORY

Q.1 Write equations for Straight line, Vogel's and Fetcovich IPR **(4)**
Q.2 What is open,semiclosed and closed installation of gas lift? Draw relevant sketch. **(4)**
Q.3 What is temperature correction factor for dome type gas lift valve.? Give relevant equation. **(4)**

Q.4 What are the main components of Coil tubing unit? What are main uses of CTU. **(4)**

Q,5 What is rigless and with rig well intervention? How paraffin and asphaltene is removed in well intervention? **(4)**

SECTION B **Marks 60 (6*10)**
All question are compulsory
Q.6
(a) List downhole components of ESP. Write design procedure of ESP **(5)**
(b) List surface components of PCP. Write design procedure of PCP. **(5)**

Q.7

(a) Write Poettmann Carpenter co-relation. Write stepwise procedure for calculation of tubing head pressure if bottomhole pressure is known. **(5)**

(b) Discuss formation sand size analysis. What is its importance in designing gravel pack? **(5)**

Q.8

(a) What are load bearing and non-load bearing solids in a formation? What are different methods of sand control? Discuss reverse circulation method of gravel pack. **(5)**

(b) Write different co-relations for calculating G-S ratio. What is uniformity coefficient and its effect on gravel pack permeability ratio? **(5)**

Q.9

(a) What is critical and sub critical flow through chokes? What is the effect of critical flow on well performance? **(5)**

(**b)** Write Gilbert's formula for choke performance. Why there is a temperature drop across choke? Write relevant formula. **(5)**

Q.10

(a) What is peak polished rod load, minimum polished rod load, pump displacement, polished rod horse power and peak torque in a sucker rod pump. How each one is calculated? **(5)**

(b) What are different configuration of downhole pumps in SRP? Explain them with relevant sketch. **(5)**

Q.11

(a) Define liquid and gas holdup, slip, no slip holdup, phase velocities, two phase density, and two phase viscosity. Give relevant equation for each. **(5)**

(b) What are velocity numbers? What is their significance? **(5)**

SECTION C **Marks 20 (1*20)**

Q.12

(a) For a flowing well, if gas density and well depth is given then how bottom hole flowing pressure is calculated? Give relevant equation. **(5)**

(b) A flowing well with 3000 ft. of tubing in the hole. When casing pressure is 550 psig its production rate is 42.bbl/day. When casing pressure is 320 psig then the production rate is 66 bbl./day. What is the productivity index of this well? Calculate static pressure of the well, and its potential? Assume straight line IPR (**15)**

OR

(a) A reservoir has three layers separated by an impermeable a layer so that each of these layers are independent. Layers have permeabilities of 1md, 100md and 10md respectively from bottom layer to top layer. Draw individual layer IPR and composite IPR. **(5)**

(b) An oil well flowing along with some water content. Well was tested at different rates. At each flow rate bottomhole flowing pressure was recorded. Given below is well test data

Gross Liquid rate BBLS/DAY	**Water content in liquid %**	**Flowing bottom hole pressure psig**
47	**85**	**1300**
90	**60**	**920**
125	**48**	**630**
162	**45**	**310**

Well was closed after this test. Calculate static pressure of the well. What is the productivity index of the oil and water zones? Assume straight line IPR. **(15)**

(a) Pressure gradient equation for single phase incompressible fluid is given below

$$-144\frac{dp}{dl}=\frac{g}{g\mathrm{c}}[\rho Sin\theta]+\frac{\rho v2}{2g\mathrm{c}\ \mathrm{d}}+\rho\frac{vdv}{g\mathrm{c}\,\alpha\mathrm{dl}}$$

In this equation, total pressure gradient is sum of three principal components. Discuss them. **(8)**

(b) Transform the above equation in to multiphase equation giving detailed process. **(12)**