UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2020

Course: PEAU 3018 Production Engineering and Well Completion   **Semester: V**
Program: APE V(Upstream)
Time: 03 hrs.   **Max. Marks: 100**

Instructions:

    This question paper has three sections, Section A,B and C

    There are total of six questions in section A, five in Section B and two in Section C.

    Section A consist of multiple choice based questions.

    Section B consist of medium length answers.

    Section C consists of two questions, out of which one is to be attempted.

    The maximum time allocated is three Hrs.

    The question paper should be attempted in blank white sheets (hand written) with all the details like programme, semester, course name, course code, name of the student, SAP-id at the top and signature at the bottom (right hand side bottom corner). Black pen should be used for better visibility and quality of scan. Please check the scan quality before uploading the scan.

SECTION A   **6x5**
Read questions carefully and give precise answers.
All questions are compulsory
5 mark for each question. Questions have sub sections and each has to be attempted.
Marks for each sub section has been given.

1. CO 1   **5x1**

   (A)MA Outer casing valve is installed a)To measure pressure between annular space between production casing and outer casing b) To pump heavy fluid in annular between production casing and outer casing c)Both a and b d) There is no valve installed on outer casing

   (B)MA Purpose of swab valve is a)To allow entry of tools in to the well b)To measure tubing head pressure c)Both a and b d) For connection to flow line

   (C)MA Surface controlled sub surface safety valve are a)Fail safe valves b)provide first line of defense to well c)Both a and b d)Gate valves

   (D)MC Control line for operating surface controlled sub surface safety valves is filled with a) Water b) Control system pressure goes above set point c) None of them d)Control system pressure falls below a set pressure

   (E) MA Expendable perforation gun is used when a)Due to bore restriction b)When no other gun is available c)Through tubing applications d) a and c Correct

2. CO 2   **5x1**

   MC(A) Which of these properties are pressure not dependent h,B,µ

a)B and μ b) h and B c) Both a and b d)h

MC (B) To convert oil well deliverability equation to gas well deliverability equation how many factors are changed (a) Four (b) Three (c) Two (d) Five

MC (C) Vogel's flow q_b is given by (a) $\frac{p_b}{1.8}$ (b) $\frac{J}{1-p_b}$ (c) $\frac{Jp_b}{1.8}$ (d) $\frac{p_b}{1.8J}$

MC/MA (D) Flow efficiency for a well, draining a cylindrical volume is given by

(a) $F=\dfrac{\dfrac{0.472r_w}{r_e}}{\left[ln\dfrac{0.47r_e}{r_w}+s\right]}$ (b) $F=\dfrac{\dfrac{0.47r_w}{r_e}}{\left[ln\dfrac{0.47r_e}{r_w}+s\right]}$ (c) $F=\dfrac{\dfrac{0.472r_e}{r_w}}{\left[ln\dfrac{0.472r_e}{r_w}+s\right]}$ (d) None of them

(e) When $p_{wf} = p_b$ then q_b =

MA (E) Partial penetration is done for (a) Avoid water coning (b) Avoid gas coning (c) Induce spherical flow (d) All of these Correct

CO 3 FIB Fill in the missing values   5x1

(A) FIB Total liquid density is calculated from oil and water densities and flow rates assuming no slippage between the oil and water $\rho_L= \rho_o f_o+ \rho_w f_w$

$$f_o=\frac{1}{1+}$$

(B) General method to calculate friction factor in turbulent flow is by Colebrook equation $\dfrac{1}{\sqrt{f}} = 1.74 - 2\log[\dfrac{2}{} + \dfrac{18.7}{}]$

(C) Pressure gradient equation under a steady-state flow condition for any single phase incompressible fluid

$$144\frac{dp}{dl} = \frac{g}{g_c}[\rho Sin\theta] + \frac{f\rho}{2g_c} + \rho \frac{v}{g_c dl}$$

(D) Drainage Área of a Horizontal Well METHOD 1 (JOSHI)

$$A=\frac{L(\ \ )+\pi b^2}{}$$

(E) Drainage Área of a Horizontal Well METHOD 2 (JOSHI)

A=—

(4) CO 4   5x1

MA (A) While designing artificial lift for any well reservoir characteristics considered are (a) Reservoir permeability (b) IPR (c) Fluid properties(d) a,b,c (e) b,c,d

TF (B) For selection of artificial lift reservoir drive mechanism will have marginal effect

(a)True (b) false

MCQ(C) For SRP, pump displacement PD in barrels per day is given by $PD = Z \times S_P \times N \times D^2_P$. The value of S_P and D is in inches. The value of z is (a) 1.176(b) 0.1176(c) 0.1166(d) 1.1166

FIB (D)Volumetric efficiency of SRP is given by $E_V =$ —

FIB (E)Net plunger stroke for SRP is given by $S_P=$

(5) CO 5   **5x1**

MCQ (A) In sand control Uniformity coefficient is given by (a) $\dfrac{(D^{80})}{(D^{50})}$ (b) $\dfrac{(D^{30})}{(D^{90})}$ (c) $\dfrac{(D^{40})}{(D^{90})}$

(d) $\dfrac{(D^{40})}{(D^{90})}$

MCQ (B) Coberly and Wagner, Hill Gumpertz defined G S ratio as

(a) $\dfrac{\text{Smallest gravel size}}{\text{10 percentile sand size}}$ (b) $\dfrac{\text{Largest gravel size}}{\text{90 percentile sand size}}$

(c) $\dfrac{\text{Smallest gravel size}}{\text{90 percentile sand size}}$ (d) $\dfrac{\text{Largest gravel size}}{\text{10 percentile sand size}}$

MCQ (C) Gravel pack permeability is highest when G S ratio is between (a) 3 and 4

(b)   2 and 4(c) 4 and 5(d) 5 and 6

FIB (D) Flow velocity in gravel pack calculated by Shwartz is
 <u>production rate cubic feet per second</u>

(E) Presence of clay or silt can be determined by adding clear water to a bottle partially full of gravel. After vigorous shaking turbidity should be (a) 2%(b) 1.5% (c) less than 1%

(d) 1.75%

6. CO 6   **5x1**

TF (A) Workover operations are may not involve full bore operation (a) True (b) False

TF (B) Slip ram in quad type BOP in CTU is used to support weight of coil tubing above the slip ram (a) True (b) FALSE

TF (C) Nodal analysis is used in self flowing wells (a) False (b) True

TF (D) In smart well completions, with packer in the casing, casing health cannot be monitored (a) True (b) False

TF (E) 3-inch of gravel thickness is taken as maximum due to practical problems of gravel placement (a) True (b) False

SECTION B		MARKS 50 5*10	
All questions are compulsory			
1. **(a)**List screening parameters for selection of ESP as a mode of artificial lift. Write design procedure of ESP **(b)**Write design procedure of PCP with relevant equations. What are parameters, which can change performance of PCP?		**5 Marks each**	**CO 4**
2. **(a)**A well is flowing with a bottomhole pressure of p_{wf}. If well depth is "D" thousand feet, calculate casing pressure of this well. Assume well depth=Tubing depth **(b)**Draw a sketch IPR of an oil well when (1) $p_{wf}>p_r$ (2) $p_{wf}<p_r$?		**5 marks each**	**CO 2**
3. **(a)**What are different methods of sand control? List out drawbacks of any two. **(b)**List out co-relations for calculating G-S ratio. What is the importance of G-S ration in gravel pack design?		**5 marks each**	**CO 5**
4. **(a)**What is critical and sub critical flow through chokes? What is the effect of critical flow on well performance? (bWrite Gilbert's formula for choke performance. Why there is a temperature drop across choke? Write relevant formula.		**5 marks each**	**CO 1**
5. **(a)**Pressure gradient equation for single phase incompressible fluid is given below $$-144\frac{dp}{dl} = \frac{g}{g_c}[\rho Sin\theta] + \frac{f\rho v^2}{2g_c d} + \rho\frac{vdv}{g_c \alpha dl}$$ Total pressure gradient is sum of three principal components. Discuss each of them. How to calculate value of "f"? **(b)** Transform the above equation in to multiphase equation giving detailed process and again calculate "f".		**5 marks each**	**CO 3**
SECTION-C		MARKS 20 1*20	
Attempt any one			
Q 1	**(a)** What is static level and dynamic level in artificial lift? What is their significance while designing any type of lift? **(b)** 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?	**a.10** **b.10**	**CO 4**

Q 2	(a) A well is flowing with a bottomhole pressure of p_{wf}. If well depth is "D" thousand feet, calculate casing pressure of this well. Assume well depth=Tubing depth		
	(b) A flowing well with 3000 ft. of tubing in the hole. Layer having permeability of 10md. is producing oil at a rate of 42bbls/day. Casing pressure is 550 psig. The reservoir has three layers separated by an impermeable a layer so that each of these layers are independent. Layers have permeability of 1md, 100md and 10md respectively from bottom layer to top layer. Draw individual layer IPR and composite IPR.	a.10. b. 10	CO 2