UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Production Engineering & Well Completion **Semester:** 5th
Program: B. Tech (APE upstream) **Time:** 03 hrs.
Course Code: PEAU3018 **Max. Marks:** 100

Instructions:
1. Neat diagrams must be drawn wherever necessary
2. Use a non-programmable calculator

	SECTION A (Scan & Upload)		
Q 1	Define the following terms: a) Absolute open hole potential b) skin factor	**4**	**CO2**
Q 2	Illustrate the basic operation of installing a gravel pack	**4**	**CO1**
Q 3	Discuss the process of obtaining the depth of perforations.	**4**	**CO2**
Q 4	Discuss the multiphase flow regimes in a vertical well	**4**	**CO2**
Q 5	Explain sieve analysis method for gravel pack selection.	**4**	**CO1**
	SECTION B (Scan & Upload)		
Q 6	Discuss the well bore clean out and mud displacement operation in detail.	**10**	**CO3**
Q 7	a) What is liquid loading? Describe the critical velocity for liquid loading. Also explain the different measures to avoid liquid loading b) A well in Gandhar oilfield has been completed with 7" OD tubing (6.33" ID) inside 9 5/8" OD casing (8.625" ID). The tubing is latched into a permanent packer at 9000' TVD. The packer fluid in the annulus is CaC12/CaBr2 brine of density 0.690 psi/ft. When the well is closed in, phase separation takes place in the tubing resulting in the following static conditions: Tubing Head Pressure = 2000 psig Gas column down to 4000' TVD, of density 0.15 psi/ft Oil column from 4000' down of density 0.375 psi/ft When the well is flowing, the pressure just below the packer is reduced by 1000 psig because of both drawdown on the reservoir and vertical lift flowing pressure loss across the reservoir interval. Calculate the imbalance of forces on the packer in both the static and dynamic phase	**10**	**CO4**
Q 8	Christmas trees, Subsurface safety Valves, Packers, Reservoir isolation valves, Side pocket mandrels, sliding side doors, Perforated joints and Landing nipples are among some of the completion string components. Briefly explain their functions.	**10**	**CO5**
Q 9	Briefly discuss and classify different type of horizontal wells using TAML classification.	**10**	**CO6**

	OR a) What do you mean by Inflow Performance Relation? State the factors effecting IPR curve. Explain Productivity Index and Vogel's & Standing correlation for IPR curve. (8 marks) b) State the function of Blast joint. (2 marks)		
SECTION C (Scan & Upload)			
Q 10	a) Discuss the well completion challenges for high pressure and high temperature well. What is the pressure and temperature condition of a HPHT well? b) A production well produces at the rate of 108 STB/D with a bottom hole pressure of 1980 psi. The bubble point of the recombined reservoir fluid to be 1825 psia at a temperature of 195°F. An initial reservoir pressure of 3620 psia was recorded during 48 hours build up following the flow test. i) Determine the unsaturated productivity index J that is valid if the flowing bottom hole pressure is greater than the bubble point. ii) Calculate the oil rate if the bottom hole pressure is held at bubble point to avoid gas blockage in the near well bore region. iii) Calculate the maximum oil rate that can be expected from the well. iv) Calculate and plot the IPR for the entire range of the well bore flowing pressure both above and below the bubble point c) State and discuss the method for analysis of past trends of declining production performance. Also, mention the three factors which characterize decline curve analysis.	**20**	**CO5**
Q 11	a) Define choke. State the function and types of chokes used in petroleum industry. Also define sonic flow & state the expression for critical pressure ratio through choke. b) Given that a well has declined from 120 bbl/day to 90 bbl/day production rate, during one month period. Use an exponential decline model to i. Predict the production rate after 11 more months. ii. Cumulative oil produced during first year. c) Discuss potential production operation problems in oil & gas wells with their mitigation technique. OR a) Discuss the well completion challenges for Deepwater well. b) Given the formation sand sieve analysis as shown in figure, select the proper gravel size for a well that is expected to be produce at a rate such that fluid velocity through half of open screen area is about 0.02m/sec c) A well-draining 40 acres is flowing at 400 bbls/day with a flowing BHP of	**20**	**CO6**

1815 psig. The average pool pressure is 2250 psig. Determine the IPR for the well at the time when the average pool pressure will be 1800 psig. Given the following additional information:

	Present	**Future**
Average pressure, psig	2250	1800
Oil viscosity at P, cP	3.11	3.54
B_o at P	1.173	1.150
K_{ro} at P	0.815	0.685