Name: **Enrolment No:**	

UPES

End Semester Examination, May 2023

Programme Name: B. Tech (APE UP) **Semester : VI**
Course Name : Artificial Lift Technology **Time : 03 hrs**
Course Code : PEAU 3034 **Max. Marks: 100**
Nos. of page(s) : 02
Instructions: All questions are compulsory. Assume data if necessary.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	List out the selection criteria to use the gas lift technology in oil?	**4**	**CO2**
Q 2	Differentiate between continuous gas lift and intermittent gas lift.	**4**	**CO2**
Q 3	Write the working procedure of intermittent gas lift with the help of diagram.	**4**	**CO2**
Q 4	List the major advantages of progressive cavity pump in oil well.	**4**	**CO4**
Q 5	Discuss the working principle of jet pumping unit.	**4**	**CO4**
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Elaborate the hydraulic pumping system with the help of diagram. Identify the application and limitations of hydraulic pumping.	**10**	**CO3**
Q 7	Describe the working procedure of progressive cavity pump with the help of neat and clean diagram. What are their disadvantage and uses of PCP?	**10**	**CO4**
Q 8	Illustrate the working procedure of continuous gas lift with the help of diagram. Also write the advantages and disadvantages of continuous gas lift.	**10**	**CO2**
Q 9	Explain the working principle and procedure of electrical submersible pump with the help of suitable diagram. Also focus on the limitation of ESP. **OR** Explain the working principle and procedure of electrical submersible progressive cavity pump with the help of suitable diagram. Also write the uses and limitation of ESPCP.	**10**	**CO3**

SECTION-C (2Qx20M=40 Marks)			
Q 10	A pumping installation consists of a $2^{1/4}$ – in. pump set at 7080 ft in $2^{7/8}$ in. tuning (2.441 – in. I.D., and 2.875 – in. O.D.) and A_p = 3.976 Sq in., A_t = 1.812 Sq in., elastic constant (E_t) = 0.221 $\times 10^{-6}$ in./lb/ft., Rod No. 76, E_r = 0.774 $\times 10^{-6}$ in./lb/ft., surface stroke of 50 in. Oil having a specific gravity of 0.81 is at a level of 5800 ft in the casing annulus. The unit utilized a rod string consisting of ¾ – in. rods and operates at 16.8 spm. Pump efficiency is 75% and 55 B/P are being produced. Determine: (a) Effecting plunger stroke (b) Tubing stretch (c) Tapered rod stretch when L_1 = 3788 ft. and L_2 = 3292 ft. (d) Polished rod stretch (e) Over-travel (f) Is this a satisfactory stroke ratio (S_p/S)? **OR** Well and Pumping unit data: Pump depth = 4500 ft., Production (100 % Volumetric efficiency) = 150 B/D, Rods No. 76 (7/8'' and 3/4''), and Plunger diameter = 1.25 in., Stroke length = 64 in., Pumping speed = 13.2 spm for conventional unit and 13.1 for Mark II. Determine prime mover (nameplate) horse power for the following four conditions: (a) Conventional unit driven by NEMA "D" motor (b) Conventional unit driven by NEMA "C" motor (c) Mark II unit driven by NEMA "D" motor (d) Conventional unit driven by NEMA "C" motor Additional data are given: For conventional Unit: Peak torque = 141000 in-lb (in-balance), Unit required = 160000 in-lb (API), Nominal horse power rating = 33, Polished rod horse power = 7 (surface efficiency 67.5%). For Mark II: Peak torque = 94000 in-lb (in-balance), Unit required = 114000 in-lb (API), Nominal horse power rating = 25, Polished rod horse power = 6.9 (surface efficiency 78%).	**20**	**CO1**
Q 11	Estimate peak and minimum polished rod loads, counterbalance required and peak torque for both Mark II and conventional units for the following conditions: Pumping depth = 5900 ft, Desired fluid production = 150 B/D, Volumetric efficiency = 80%, Stroke length = 64 in., Pumping speed = 16.5 spm, Pump diameter $1^{1/4}$ in., Rod number = API No. 76, Fluid specific gravity = 1.0. Additional data are given: Rod weight = 1.814 lb/ft., A_p = 1.227 sq in., TF_{max} = 34, TF_1 = 29 and TF_2 = 37.	**20**	**CO1**