Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: System Analysis & Optimization **Semester: 2**
Program: M.Tech. Pipeline Engineering
Time: 03 hrs.Max. **Marks: 100**

Instructions:

SECTION A
(Attempt All Questions)

S. No.		Marks	CO
Q.1	Explain the deterministic and Stochastic techniques for solving pipeline optimization problems	4	CO1, CO2
Q.2	Explain the importance of using evolutionary methods over Classical optimization problems	4	CO2
Q.3	Discuss the difference between behavior, design and side constraints	4	CO1
Q.4	Mention four application of optimization in pipeline industry.	4	CO5
Q.5	Briefly discuss the Genetic Algorithm to minimize a function.	4	CO3, CO4
	SECTION B **(Attempt All Questions)**		
Q.5	A pipeline operator wishes to minimize the cost of pipeline network, Using Dichotomous search method, find the minimum of the function f = x(x-1.5) in the interval (0.0, 1.00) to within 10% of the exact value	10	CO4
Q.6.	Temperature, pressure, and composition of gas mixtures in deep water pipelines are the factors that promote rapid formation of gas hydrates. To avert this dilemma, it is more significant to find out the optimum temperature and pressure in subsea pipelines to limit the formation of gas hydrates. Researches carried on lab scale reveals that gas hydrate formation depends on temperature and pressure according to the following relation: $$f(P,T) = 6P^2 - 6PT + 2P^2 - P - T$$ Take starting point as: $X(P,T) = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$	10	CO4

	Using **Fletcher Reeves** method, find the values of the variables Pressure and Temperature that minimizesthe gas hydrate formation.		
Q.7.	Use exterior penalty method to minimize the function given by: $f = 2x_1^2 + 3x_2^2 + x_1 + x_2$ $S.T:$ $g(x_1) = 5 - x_1 \le 0;$ $g(x_2) = -x_2 \le 0$	**10**	**CO3**
Q.8.	Use steepest descent method to minimize the following function: $f(x) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2;$ Take the starting point as: $X = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$	**10**	**CO2, CO3**
	SECTION-C **(Attempt Any Two Questions)**		
Q.9.	Using Golden Section method minimize the function given by: $f(x) = 0.65 - \left(\frac{0.75}{1+x^2}\right) - 0.65\tan^{-1}\left(\frac{1}{x}\right)$ Use the interval $(0,3)$ and n=6;	**20**	**CO5**
Q.10	Using Kuhn Tucker method minimize the following function: $f(x_1, x_2, x_3) = x_1^2 + x_2^2 + x_3^2 + 40x_1 + 20x_2;$ $g_1 = x_1 - 50 \ge 0;$ $g_2 = x_1 + x_2 - 100 \ge 0;$ $g_3 = x_1 + x_2 + x_3 - 150 \ge 0$	**20**	**CO3**
Q.11	Using Genetic Algorithm, minimize the following function: $f(x) = x_1 + 2x_2 + 3x_3 + 4x_4 - 30;$ $0 \prec x_i \prec 30$ Use cross over rate as 0.25 and mutation rate as 0.1.	**20**	**CO4, CO5**