Name: ______________________________

Enrollment No: ------------------------

UNIVERSITY OF PETROLEUM & ENERGY STUDIES
End Semester Examination

Course:	**Systems Analysis and Optimization**	**Semester: II**
Program:	**M. Tech. Chemical Engg. (spl. PD); CE-PD**	**Time: 3 Hrs**
Course Code:	**CHPD 7012**	**Max. Marks: 100**

No. of pages: 0 + 3

INSTRUCTIONS: In this **OPEN BOOK(S) (any number of books and kind) and NOTES EXAM**, you are allowed to have any book**s**, ***all*** handouts provided (including your textbook in xeroxed form), ***your own class-notes*** and your solutions to assignment problems, ***etc.***

1. Show all ***intermediate steps*** of your answers (and not just the final answers) to earn marks
2. ***Please answer the questions in the sequence: 1, 2, 3.*** You can do this by assigning, *a priori*, a few pages to each question, in the correct sequence. You may then answer the questions in whatever sequence you wish to, ***all parts in one place***
3. No student is allowed to leave the examination hall in the first hour of the exam

Section A: XXX

No questions here (open books exam)

Section B: XXX

No questions here (open books exam)

Section C: ALL THREE QUESTIONS ARE COMPULSORY [Total 100 Marks]

Q.1 Find the optimum value of the radius, r, and height, h, of a cylinder (as shown in the diagram on the next page) which can be fully inscribed within a sphere of radius, 10 m. The optimum cylinder should have the maximum volume.

…… Continued

Cylinder (shaded)

(30 Points)

Q. 2 We wish to minimize

$$Min f(x_1, x_2) \equiv (x_1 - 2)^2 + (x_2 - 1)^2$$

with the ***equality*** constraint

$$g_1(x_1, x_2, x_3) \equiv x_1 + x_2 - x_3^2 - 3 = 0$$

Use the penalty function technique with υ as the penalty parameter to

(a) write the expression for the function, *F*, incorporating the constraint (5)

(b) deduce ***all*** the equations for optimality (12)

(c) solve these equations taking $x_3 = 0$ (this leaves only three equations in three variables) (8)

(d) Solve these equations to give x_1 and x_2

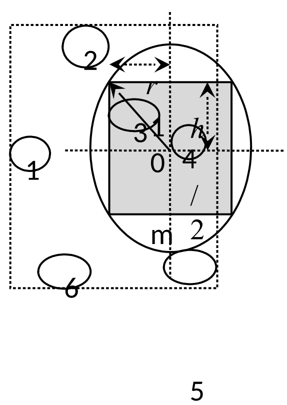
(e) Can you get a value of υ (5)

(***30 points***)

Continued…

Q. 3 (***Open-ended Problem again, possibly with several solutions***)

We would like to solve the TSP (Travelling Salesman Problem) discussed in the Lecture using GA (and in Chapter 5 of the book), with Headquarter as Node 1, and five additional nodes/shops numbered 2, 3, 4, 5 and 6, as shown in the diagram below, using **<u>Single-Objective Simulated Annealing (SSA)</u>**.



Develop the algorithm you would use to minimize the total distance covered by the salesman from Node 1 and back to node 1 with the standard assumptions of the TSP. The coordinates, x_i, y_i, are given for each node.

(***40 Points***)

* * *

Users New 2010-/Courses/Process Optimization/CHEG 455 2018-19-II End Semester Exam