Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2022 - 2023
MIDSEM TEST (Regular)
(Open Book)

Course No: CE F411
Course Name: Operations Research for Engineers
Max. Marks: 30
Date: 03-11-2022
Weightage: 30 %
Time: 01.30 pm – 03.00 pm

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1) Use Kung et al.'s efficient method to identify the different pareto fronts from the following points (all objectives are to be maximized): **(6 M)**

Solution ID	f_1	f_2	f_3
1	2.2	3.6	1.1
2	5.2	1.8	9.9
3	3.4	4.2	9.9
4	2.7	2.9	2.7
5	3.5	3.3	2.3
6	4.1	4.5	5.2
7	7.5	2.2	1.7
8	0.7	6.4	4.9
9	6.5	5.1	6.5
10	9.2	2.8	3.2
11	1.4	3.3	7.5
12	5.7	6.5	2.2

2) Determine the optimal solution of the following LPP without using artificial variables. **(6 M)**

$$\textbf{Minimize } z = 4x_1 + 6x_2 + 3x_3 - x_4$$
$$\textbf{subject to}$$
$$x_1 + x_3 - x_4 \geq 2$$
$$x_2 + x_3 + x_4 \geq -3$$
$$x_1, x_2, x_3, x_4 \geq 0$$

3) IKEA furniture company assembles two types of kitchen cabinets: Type A and Type B. Type A cabinets are painted white and the Type B are varnished. Both painting & varnishing are carried out in one department. The assembly department can produce a maximum of 200 Type A cabinets and 150 Type B cabinets per day. Varnishing a Type B cabinet takes twice as much as painting a Type B one. If the painting/ varnishing department is dedicated to the Type B only, it can complete 180 units daily. The company estimates that the profits per unit for Type A and Type B cabinets are Rs.1000/- & Rs.1500/- respectively. Formulate an LPP & find the optimal production schedule per day. Suppose due to competition, the profits per unit of Type A and Type B units must be reduced to Rs.800/- and Rs.1200/- respectively, determine the revised optimal production schedule per day. **(6 M)**

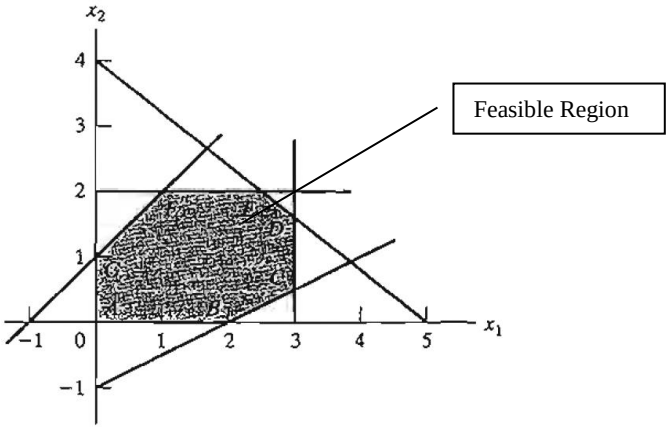
4) $Maximize\ f(x) = 3x_1 + 4x_2$

subject to

$$3x_1 - x_2 \leq 12$$
$$3x_1 + 11x_2 \leq 66$$
$$x_1 \geq 0, x_2\ is\ an\ integer.$$

Solve the ILP using Gomory's cutting plane method. **(6 M)**

5) The objective function of a problem is Maximize $z=3x_1+6x_2$. The two-dimensional search space of the problem is shown below. Determine the optimum solution of the given problem using simplex method. **(6 M)**



ALL THE BEST