0500

National University of Computer and Emerging Sciences, Lahore Campus

Course Name:	Operations Research	Course Code:	MT 4031
Degree Program:	BCS	Semester:	Spring 2024
Exam Duration:	60 min.	Total Marks:	30
Paper Date:	27.02.2024	Weight	15 %
Sections:	All	Page(s):	
Exam Type:	Sessional-I		

Instruction/ Notes:

i. **Clearly write your name, roll no and section on the first page of answer book.**
ii. **Attempt all questions neatly.**
iii. **Exchange of calculators is not allowed.**
iv. **Read the questions carefully for clarity of context and understanding of meaning and make assumptions wherever required, for neither the invigilator will address your queries, nor the teacher/examiner will come to the examination hall for any assistance.**

Question 1: (marks: 8+4)

a. Solve the following linear programming model graphically.

$$\text{Max} \quad z = 5x + 4y$$

subject to

$$\begin{aligned} -6x + 4y &\le 24 \\ 6x + 3y &\le 22.5 \\ x + y &\le 5 \\ x + 2y &\le 6 \\ -x + y &\le 1 \\ y &\le 2 \\ x, y &\ge 0 \end{aligned}$$

b. Identify the redundant constraints and show that their removal does not affect the solution space or the optimal solution.

Question 2: (marks: 3+7)

A compony produces 3 types of toys. The maximum production limit of the three types per month is 7 toys in total. Production time of a type 1, type 2 and type 3 toy is 2 hours, 5 hours and 3 hours respectively. The minimum work hours available in a month are 10 hours. The profit of a type 1, type 2 and type 3 toy is \$1, \$2 and \$3 respectively.

i. formulate a linear programming model for the given scenario.
ii. Use any appropriate technique to find the number of each type of toys to be produced to maximize the profit.

Question 3: (marks: 8)

Determine dual price (the value of objective function) and the feasibility range of the variables from the given optimal tableau:

							Solution			
Basic	x_1	x_2	x_3	x_4	x_5	x_6	*RHS*	D_1	D_2	D_3
z	4	0	0	1	2	0	1350	1	2	0
x_2	$-\frac{1}{4}$	1	0	$\frac{1}{2}$	$-\frac{1}{4}$	0	100	$\frac{1}{2}$	$-\frac{1}{4}$	0
x_3	$\frac{3}{2}$	0	1	0	$\frac{1}{2}$	0	230	0	$\frac{1}{2}$	0
x_6	2	0	0	−2	1	1	20	−2	1	1