Enroll. No._____

MARWADI UNIVERSITY

Faculty of Engineering Technology

ICT

BTech **SEM: 6th** **MID-SEM. EXAM: I** **Feb : 2024**

Subject: - OT (01CT0614) **Date:-26/02/2024**

Total Marks:-30 **Time: - 75 Minutes**

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Do not write/sign/indication/tick mark anything other than Enroll No. at a specific place on the question paper.

Question: 1. : MCQ [6]

(a) Managerial decisions are based on
   i. an evaluation of quantitative data
   ii. the use of qualitative factors
   iii. results generated by formal models
   iv. all of the above

(b) An optimization models
   i. provides the best decision
   ii. provides decision within its limited context
   iii. helps in evaluating various alternatives
   iv. all of the above

(c) Operational Research approach is typically based on the use of
   i. Physical model
   ii. Mathematical model
   iii. Iconic model
   iv. Descriptive model

(d) Decision variables are
   i. Controllable
   ii. Uncontrollable
   iii. parameters
   iv. none of the above

(e) The best use of linear programming technique is to find an optimal use of
   i. money
   ii. manpower
   iii. machine
   iv. all of the above

(f) Constraints in an LP model represents
   i. Limitations
   ii. Requirements
   iii. Balancing limitations and requirements
   iv. All of the above

Question: 2. [12]

(a) Discuss the advantage and limitations of operations research [6]

(b) A company machines and drills two castings X and Y. The time required to machine and drill one casting including machine set-up time is as follows:

Casting	Machine Hours	Drilling Hours
X	4	2
Y	2	5

There are two lathes and three drilling machines. The working week is of 40 hours; there is no lost time and overtime. Variables costs for both castings are Rs 120 per unit while total fixed costs amount to Rs 1,000 per week. The selling price of casting X is Rs 300 per unit and that of Y is Rs 360 per unit. There are no limitations on the number of X and Y casting that can be sold. The company wishes to maximize its profit. You are required to

(i) formulate a linear programming model for the problem and
(ii) solve this problem.

[6]

OR

(b) A furniture manufacturer makes two products: chairs and tables. These products are processed using two machines – A and B. A chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours on machine A and no time on machine B. There are 16 hours per day available on machine A and 30 hours on machine B. The profit gained by the manufacturer from a chair is Rs 2 and from a table is Rs 10. Solve this problem to find the daily production of each of the two products.

[6]

Question: 3. [12]

(a) A person requires 10, 12 and 12 units of chemicals A, B and C, respectively for his garden. A typical liquid product contains 5, 2 and 1 unit of A, B and C, respectively per jar. On the other hand a typical dry product contains 1, 2 and 4 units of A, B and C per unit. If the liquid product sells for Rs 3 per jar and the dry product for Rs 2 per carton, how many of each should be purchased in order to minimize the cost and meet the requirement?

Solve using Simplex Method [8]

(b) Solve the above question using Graphical Method [4]

OR

(a) A manufacturing firm has discontinued the production of a certain unprofitable product line. This has created considerable excess production capacity. Management is considering to devote this excess capacity to one or more of three products; call them product 1, 2 and 3. The available capacity on the machines that might limit output is summarized in the following table

Machine Type	*Available Time (in Machine-hours per Week)*
Milling Machine	250
Lathe	150
Grinder	50

The number of machine-hours required for each unit of the respective product is as follows

Machine Type	*Productivity (in Machine-hours per Unit)*		
	Product 1	*Product 2*	*Product 3*
Milling Machine	8	2	3
Lathe	4	3	0
Grinder	2	–	1

The profit per unit would be Rs 20, Rs 6 and Rs 8, respectively for product 1, 2 and 3. Find how much of each product the firm should produce in order to **maximize** its profit

[8]

(b) A pharmaceutical company has developed a new pill to be taken by smokers that will nauseate them if they smoke. This new pill is a combination of four ingredients that are costly and in limited supply. The available supply and costs are as follows:

Ingredient	*Supply Availability (kg)*	*Cost (Rs/kg)*
1	22	28
2	18	25
3	20	52
4	24	26

Blending requirements for this new pill are as follows:

i. Ingredient 1 must be at least 45 per cent of the total quantity, but cannot exceed 60 per cent of the total.
ii. Ingredients 2 and 3 must each comprise at least 10 per cent of the mixture, but their combined percentage cannot exceed 25 per cent of the total quantity.
iii. Ingredient 4 must not be more than 50 per cent of the total quantity. Additionally, at least 25 kg of the pill must be produced

Formulate this problem as an LP model to determine optimum blending of ingredients.

[4]

---Best of Luck---

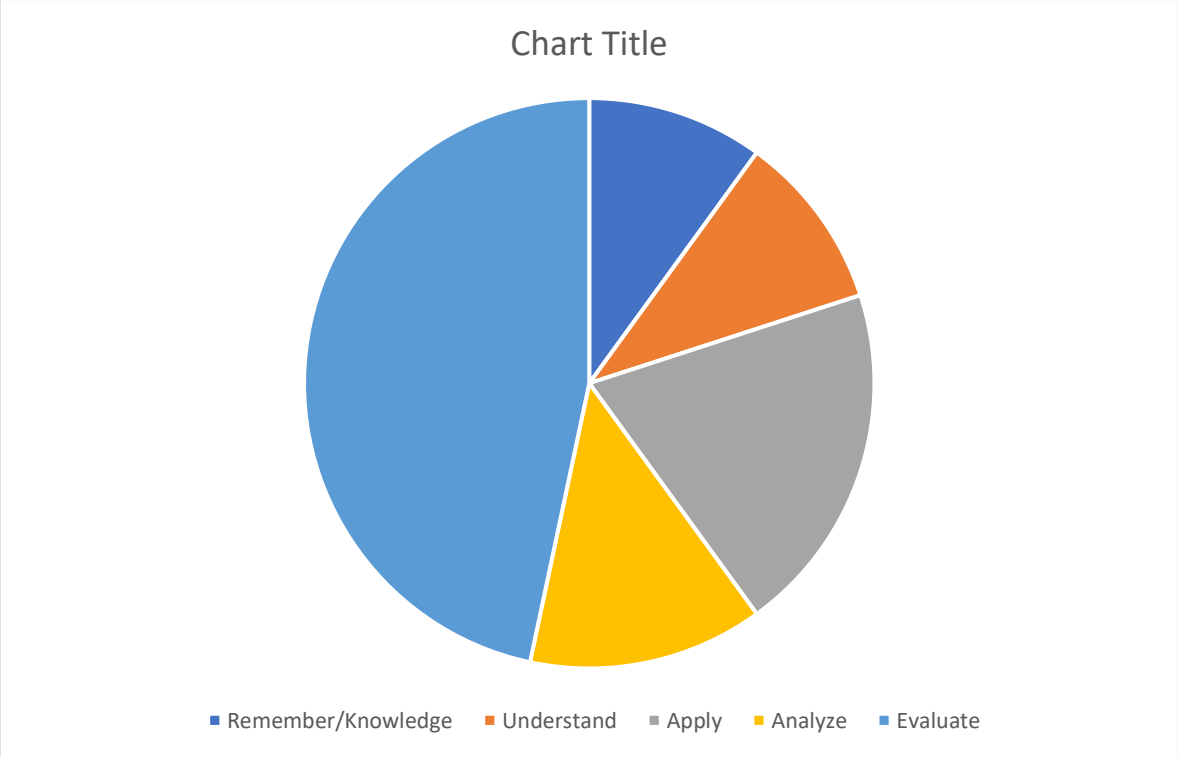
- **Bloom'S Taxonomy Report** –

Sub: Optimization Technique
Sem. 6th
Branch:ICT

Que. Paper weightage as per Bloom's Taxonomy

LEVEL	% of weightage	Question No.	Marks of Que.
Remember/Knowledge	10	1	3
Understand	10	1	3
Apply	20	2	6
Analyze	14	3	4
Evaluate	46	2,3	14
Higher order Thinking/ Creative			

Chart/Graph of Bloom's Taxonomy



Course Outcome Wise Questions

Subject Code	**01CT0614**	Subject	**OPTIMIZATION TECHNIQUES**

CO No.	Course Outcome
CO1	Cast engineering minima/maxima problems into optimization framework.
	1(A), 2(A)
CO2	Learn efficient computational procedures to solve optimization problems
	3(B), 3(B-Or)
CO3	Apply optimization concepts to deal with real world situations
	3(A), 3(A-Or)
CO4	Design the simulation model for the given case study problem
	2(B), 2(B-Or)

Blooms Taxonomy	Question List
Remember / Knowledge	1(A)
Understand	1(A)
Apply	2(A)
Analyze	3(B), 3(B-Or)
Evaluate	2(B), 2(B-Or), 3(A), 3(A-Or)
Higher order Thinking / Creative	