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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
M.Tech.

SEM: II - CARRY OVER THEORY EXAMINATION - JUNE (2021 - 2022)

Subject: Optimization Techniques

Time: 3 Hours

Max. Marks: 70

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 4 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 7 marks each.
5. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A

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1. Attempt all parts:-

- 1-a. _____ is a mathematical technique used to solve the problem of allocating limited resource among the competing activities [CO1] 1
- (a) Linear Programming problem
 - (b) Assignment Problem
 - (c) Replacement Problem
 - (d) Non linear Programming Problem
- 1-b. The coefficient of slack\surplus variables in the objective function are always assumed to be _____ [CO2] 1
- (a) 0
 - (b) 1
 - (c) M
 - (d) NEGATIVE M
- 1-c. An initial estimate of an optimal solution is given to be used in conjunction with the steepest ascent method to determine the maximum of the function. Which of the following statements is correct? [CO3] 1
- (a) The function to be optimized must be differentiable.
 - (b) If the initial estimate is different than the optimal solution, then the magnitude of the gradient is nonzero.
 - (c) As more iterations are performed, the function values of the solutions at the end of each subsequent iteration must be increasing.
 - (d) All 3 statements are correct.
- 1-d. Which of the following statement about relation between strict and weak stationary process is true? [CO4] 1
- (a) A strict stationary process with finite process is also weak stationary process.
 - (b) A weak stationary process is always strict stationary process.
 - (c) There is no relation between strict and weak stationary processes.
 - (d) A weak stationary process following gamma distribution is strict stationary process.
- 1-e. SA needs to remember the best solutions it comes across if a rising temperature schedule is followed. This is because: [CO5] 1
- (a) The probability of accepting any transition is increasing.
 - (b) SA may get further from the optimal solution as the process unfolds.
 - (c) SA will behave more and more like dart-throwing.
 - (d) All of the above.

2. Attempt all parts:-

- 2.a. What are the main characteristics that a good model for Operations Research should have ? [CO1] 2
- 2.b. Explain the basic assumptions of a linear programming problem. [CO2] 2
- 2.c. Difference between Transient and steady states. [CO3] 2
- 2.d. Explain Gomorian constraint (or) Fractional Cut constraint. [CO4] 2
- 2.e. What are the advantages of Dynamic programming? [CO5] 2

SECTION B

20

3. Answer any five of the following:-

- 3-a. Discuss various phases in solving an OR problem. [CO1] 4
- 3-b. How no feasible solution is recognized when using the simplex algorithm.[CO1] 4
- 3-c. Use the graphical method to solve the following LP problem Maximize $Z = 40X_1 + 36X_2$; 4
subject to $5X_1 + 3X_2 \geq 45$; $X_1 \leq 8$; $X_2 \leq 10$ $X_1, X_2 \geq 0$
[CO2]
- 3-d. Find the initial BFS by north-west corner rule and least cost method for the following 4
transportation problem. [CO2]

	W	X	Y	Z	Availability
A	19	30	50	10	7
B	70	30	40	60	9
C	40	8	70	20	18
Requirement	5	8	7	14	

- 3.e. Write down the Algorithm of Univariate method. [CO3] 4
- 3.f. State Bellman's principle of optimality. [CO4] 4
- 3.g. Distinguish between deterministic model and probabilistic model. [CO5] 4

SECTION C

35

4. Answer any one of the following:-

- 4-a. A television company has three major departments for manufacture of its two models A and B. Monthly capacities are given as follows 7

Departments	Per unit time requirements(hours)		Hours available in this month
	Model A	Model B	
I	4.0	2.0	1600
II	2.5	1.0	1020
III	4.5	1.5	1600

The marginal profit of model A is Rs.400 each and that of model B is Rs.100 each. Assuming that the company can sell any quantity of either product due to favorable market conditions, determine the optimum output for the models, the highest possible profit and the slack time in the three departments? Formulate as LPP model and solve it by simplex method. (CO1)

- 4-b. State the optimization problem. Classify and explain various types of optimization problems with examples. (CO1) 7

5. Answer any one of the following:-

- 5-a. Solve the following LPP by Big M method (CO2) 7

$$\begin{aligned} \text{Max } Z &= 4x_1 + 5x_2 - 3x_3 + 50 \\ \text{Subjected to: } &x_1 + x_2 + x_3 = 10 \\ &x_1 - x_2 \geq 1 \\ &2x_1 + 3x_2 + x_3 \leq 40 \quad x_i \geq 0 \end{aligned}$$

- 5-b. Use Vogel's approximation method to obtain an initial basic feasible solution of the transportation problem & find the optimal solution. (CO2) 7

	W	X	Y	Z	Supply

A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

6. Answer any one of the following:-

6-a. Find $Min Z = x^3 - 3x - 5$. Take initial interval as $[0, 1.2]$ and accuracy $\alpha = 10\%$. Solve it by Fibonacci method. (CO3) 7

6-b. Min $f(x_1, x_2) = 4x_1^2 + 3x_2^2 - 5x_1x_2 - 8x_1$ from starting from point $(0,0)$ by using Powell's method. Show calculations only for three cycles. (CO3) 7

7. Answer any one of the following:-

7-a. Explain interior penalty function method for a constrained non-linear programming problem. (CO4) 7

7-b. Explain the terminology involved in dynamic programming. (CO4) 7

8. Answer any one of the following:-

8-a. Draw the flow chat of Genetic Algorithms and Explain the basic operations used in genetic Algorithms. (CO5) 7

8-b. Write a short note on optimization softwares. (CO5) 7