GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER - I • EXAMINATION - SUMMER • 2014

Subject code: 710904N

Date: 21-06-2014

Subject Name: Optimization Techniques

Time: 02:30 pm - 05:00 pm **Instructions:**

Total Marks: 70

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- (a) A television manufacturing company has to decide on the number of 070.1 27 and 20 inch sets to be produced at one of its factories. Market research indicates that at most 40 of the 27 inch and 10 of the 20 inch sets can be sold per month. The maximum number of work hours available is 500 per month. A 27 inch set requires 20 work hours and a 20 inch set requires 10 work hours. Each 27 inch sold produces a profit of Rs 6000 and each 20 inch produces a profit of Rs 4000. A wholesaler has agreed to purchase all the television sets produced if the numbers do not exceed the maxima indicated by the market research. Formulate a LP model for this problem and solve this model graphically
 - (b) With the help of suitable examples explain the significance of (i) slack 07variables (ii) surplus variables and (iii) artificial variables, in the context of LP modeling.
- Q.2 (a) Solve by Simplex method. Maximize $z = x_1 + 2x_2 + x_3$ Subjected to $2x_1 + x_2$. x3 m2 $.2x_1 + x_2 . 5x_3 - 6$ $4x_1 + x_2 + x_3 m6$ $x_1, x_2, x_3^- 0$
 - (b) State the necessary and sufficient conditions for the maximization of a 07 multivariable function f(x)

OR

- (b) Find the minimum or maximum, if any, for the function $f(x) = 4x^3$. $18x^2 + 27x$. 7
- Q.3 (a) A rectangular beam is to be cut from a circular log of radius $\exists \phi$ Find 07 the cross-sectional dimensions of the beam to (a) maximize the cross sectional area of the beam, and (b) maximize the perimeter of the beam section
 - (b) Using Lagrange multiplier method, find the dimensions of a closed 07 cylindrical soft drink can that can hold soft drink of volume V for which the surface area (including the top and bottom) is a minimum. OR

(a) Explain the significance of post optimality analysis of a simplex linear 0.3 07 programming problem.

How does simplex algorithm indicate that:

1. There is an alternate optimal solution?

- 2. The problem has unbounded optimal solution?
- 3. The problem has no feasible solution?

07

07

follows:				
Company	JOB			
	1	2	3	4
А	90	18	48	50
В	72	28	85	80
С	53	92	12	78
D	20	70	70	25

(b) The cost to perform different jobs by different workers is given as 07 follows:

Obtain optimal assignment of jobs to Company. Use branch and bound method to solve the given integer programming problem.

- Q.4 (a) Find the minimum of the function F = x5-5x3-20x+10 using golden 07 section method in the interval of (0.5)
 - (b) What is SLP Method. why it is calling Cutting Plane method 07

OR

- Q.4 (a) Explain dynamic programming. How is it different from linear 07 programming? Distinguish between deterministic and probabilistic dynamic programming and give some examples where dynamic programming may be used.
 - (b) Find the dimensions of a box of largest volume that can be inscribed in 07 a sphere of unit radius. Use direct substitution method.
- Q.5 (a) State the necessary and sufficient conditions for the minimum of a function f(X). Also determine the maximum and minimum values of the function: $f(X) = 12X^5 - 45X^4 + 40X^3 + 5$
 - (b) Show that volume of the largest right circular cylinder that can be inscribed in given right circular cone is 4/9th the volume of cone.

OR

- Q.5 (a) Explain some of the practical application of integer programming 07 problem
 - (b) Find extreme points of the function $f(X1, X2) = X_1^3 + X_2^3 + 2X_1^2 + 4X_2^2 + 6$ 07
