

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Code No. : 22816

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD

M.E. (Mech. Engg.: CBCS) II-Semester Main Examinations, June-2018

(Advanced Design & Manufacturing)

Optimization Techniques

Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Define linear programming problem.
2. Explain an unbounded solution.
3. Explain the difference between Newton and Quasi Newton methods.
4. Discuss the characteristics of a direct search method.
5. List Kuhn-Tucker conditions to solve nonlinear programming problems.
6. Define the constrained optimization problem.
7. Discuss the Concept for the evolution of particle swarm optimization.
8. Explain the applications of Bellman's principle of optimality.
9. Distinguish between CPM and PERT.
10. Identify the importance of resource allocation.

Part-B (5 × 8 = 40 Marks)

11. a) List the applications of transportation problem in the industries. [2]
b) A plant is engaged on the production of two products which are processed through three departments, the number of hours required to finish each is indicated in the table below [6]

Machine Type	Product		Max. Hours Available per week
	A	B	
I	7	8	1600
II	8	12	1600
III	15	16	1600

If the profit for the products is ₹6 for a unit of product A but only ₹4 for a unit of product B, what quantities per week should be planned to maximize profit.

12. a) Discuss Univariate method with example. [3]
b) Solve two iterations of Cauchy's steepest descent method to minimize the function [5]
 $f(X_1, X_2) = X_1^2 - 2X_2^2 + 2X_1 + 4X_2 + 6$ starting from (0, 0).

13. a) Classify non-linear programming constrained optimization methods. [2]

- b) Consider the following problem [6]

$$\text{Minimize } f(x) = x_1^2 + x_2^2 + x_3^2$$

$$\text{Subject to } x_1 + x_2 + x_3 \geq 5$$

$$2 - x_2 x_3 \leq 0$$

$$x_1 \geq 0, x_2 \geq 0, x_3 \geq 2$$

Explain whether the Kuhn-Tucker conditions are satisfied at the following points

$$x_1 = \begin{bmatrix} 3/2 \\ 3/2 \\ 2 \end{bmatrix}, x_2 = \begin{bmatrix} 4/3 \\ 2/3 \\ 3 \end{bmatrix}, x_3 = \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$$

14. a) Explain the branch and bound method. [2]

b) A firm has divided its marketing area in to 3 zones. The amount of sales depends upon the number of salesmen in each zone. The firm has been collecting the data regarding sales and salesman in each area over a number of past years. The data is given below. [6]

Number of sales men	0	1	2	3	4	5	6	7	8	9
Zone1	30	45	60	70	79	90	98	105	100	90
Zone2	35	45	52	64	72	82	93	98	100	100
Zone3	42	54	60	70	82	95	102	110	110	110

15. The time estimate for different activities is as follows: [8]

Activity	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
T _o	4	6	3	2	9	7	4	5	7
T _m	8	10	6	4	13	10	7	8	10
T _p	10	14	8	7	15	9	12	10	12

- a) Draw a PERT network diagram.
- b) Calculate the estimated project duration.
- c) Calculate the variance of the critical path.
- d) Calculate the probability of completing the project in 30 days.

16. a) Differentiate simplex of LPP and revised simplex method. [4]

b) Explain any one of random search methods. [4]

17. Write short notes on any *two* of the following:

- a) Penalty function [4]
- b) Genetic algorithm [4]
- c) Crash analysis [4]