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- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What are Engg. Optimization problem? Explain design & manufacturing in detail. 8
- b) Explain how to formulate the procedure for setting minimum & maximum bounds on each design variables. 6

OR

2. a) Explain following. 9
- i) Optimal design of truss structure ii) Optimal design of a car suspension.
- b) Explain the types of constraints that are associated with the optimization problem. 5
3. What is local optimization? Explain in detail with example & list its advantages. 13

OR

4. What is global optimization? Explain in detail with suitable example & list its advantages and disadvantages. 13
5. a) Minimize the function 8
- $$f(x) = x^2 + 541x$$
- using Fibonacci search method.
- b) Write an algorithm for Exhaustive search method. 5

OR

6. a) Explain point estimation method algorithm in detail. 7
- b) Explain Bounding phase method in detail. 6
7. a) Explain Powell's conjugate direction method in detail. 8
- b) Explain simplex search method in detail. 6

OR

8. a) Consider the unconstrained function $f(X_1, X_2) = (X_1^2 - X_2^2)^2 + X_2^2$. Perform five iteration of unidirectional search using the golden section search method along the following search direction.
 $S = (2, 1)^T$ from the point $(-5, 5)^T$ upto the point $(5, 0)^T$. 8
- b) Explain Newton's Method in detail. 6
9. a) Minimize $(X_1^2 + X_2 - 11)^2 + (X_1 + X_2^2 - 7)^2$ 7
 Subject to $(X_1 - 5)^2 + X_2^2 - 26 \geq 0$, $X_1, X_2 \geq 0$
 Using penalty function method.
- b) Explain Kuhn-Tucker conditions of constrained optimization algorithm. 6
- OR**
10. Explain the followings in detail, 6
- i) Variable Elimination method algorithm. 6
- ii) Complex search method algorithm. 7
11. a) Solve the following 8
 Maximize $f(X) = 2X_1 + 3X_2$
 Subject to $X_1 \leq 6$
 $X_1 + 2X_2 \leq 10$
 $X_1, X_2 \geq 0$
 using simplex method.
- b) Write a short note on duality theory in linear programming. 5
- OR**
12. a) Explain sensitivity analysis of linear programming. 7
- b) Explain Artificial variables & dual phase method. 6



~ Walt Disney

