

1. Apply Crouts method to solve the equations
 $x + y - z = 2$; $2x + 3y + 5z = -3$; $3x + 2y - 3z = 6$
2. Solve the following system of linear equations using Gauss Seidel method
 $10x + 2y + z = 9$; $2x + 20y - 2z = -44$; $-2x + 3y + 10z = 22$;
3. Find LU decomposition of the coefficient matrix A and hence solve the system of equations:
 $3x + y + z = 1$; $3x + 5y + z = 3$; $6x + y + 11z = -3$.
4. Solve the following system of linear equations using Gauss Seidel method
 $83x + 11y - 4z = 95$; $7x + 52y + 13z = 104$; $3x + 8y + 29z = 71$;
5. Find the lowest degree polynomial $f(x)$ that will fit the data:

X	0	2	4	6	8
$f(x)$	5	9	61	209	501

Also find $y(5)$.

6. Use Newton forward interpolation formula to find the cubic polynomial which takes on the following values:

X	0	1	2	3
Y	1	2	1	10

7. Find the cubic polynomial interpolation which takes on the values
 $f_0=5, f_1=1, f_2=9, f_3=25, f_4=55$. Hence find f_5 .
8. Apply Runge Kutta method to find an approximate value of y when $x=0.2$, given that
 $dy/dx = x + y, y=1$ when $x=0$.
9. Apply Runge Kutta method to find an approximate value of y when $x=0.2$, given that $dy/dx = x + y^2, y=1$ when $x=0$.
10. Calculate an approximate value of $\int_0^{\pi/2} \sin x dx$
 using
 (i) Trapezoidal rule
 (ii) Simpsons rule using 11 ordinates.
11. Evaluate $\int_0^1 \sqrt{\sin x + \cos x} dx$ using Simpson's one third rule by dividing the interval into six equal parts.
12. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Simpson's one third rule and Simpson's 3/8th rule.

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1. Define the Hessian matrix. Solve the non-linear programming problem given below:

$$\begin{aligned} \text{Optimize } Z &= x_1^2 + x_2^2 + x_3^2 \\ \text{Subject to } x_1 + x_2 + 3x_3 &= 2, \\ 5x_1 + 2x_2 + x_3 &= 5, \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

2. A positive quantity 'b' is to be divided into 'n' parts in such a way that the product of 'n' parts is to be a maximum. Use Lagrange multipliers method to obtain the optimal sub-division.

3. Show that $F(X)$ is convex by expressing it as a sum of functions of one or two variables and then proving that all the functions are convex, where

$$F(X) = 5x_1 + 2x_2^2 + x_3^2 - 3x_3x_4 + 4x_4^2 + 2x_5^4 + 3x_5x_6 + 6x_6^2 + 3x_6x_7 + x_7^2.$$

4. Solve the following non-linear programming problem. Is the solution a maxima or minima? Optimize $Z = 6x_1x_2 - 10x_3$

$$\begin{aligned} \text{Subject to } 2x_1 + x_2 + 3x_3 &= 10, \\ x_1, x_2, x_3 &\geq 0. \end{aligned}$$

5. Solve the following non-linear programming problem. Is the solution a maxima or minima? Optimize $Z = x_1^2 - 10x_1 + x_2^2 - 6x_2 + x_3^2 - 4x_3$

$$\begin{aligned} \text{Subject to } x_1 + x_2 + x_3 &= 7, \\ x_1, x_2, x_3 &\geq 0. \end{aligned}$$

6. Solve the following non-linear programming problem. Is the solution a maxima or minima? Optimize $Z = 4x_1 + 9x_2 - x_1^2 - x_2^2$

$$\begin{aligned} \text{Subject to } 4x_1 + 3x_2 &= 15, \\ 3x_1 + 5x_2 &= 14 \\ x_1, x_2, x_3 &\geq 0. \end{aligned}$$

7. Solve the following non-linear programming problem. Is the solution a maxima or minima? Optimize $Z = 4x_1 - 4x_1x_2 + x_3^2 + 2x_2^2$

$$\begin{aligned} \text{Subject to } x_1 + x_2 + x_3 &= 15 \\ 2x_1 - x_2 + 2x_3 &= 20 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

8. Solve the following non-linear programming problem. Is the solution a maxima or minima? Optimize $Z = kx^{-1}y^{-2}$

$$\begin{aligned} \text{Subject to } x^2 + y^2 &= 3, \\ x, y &\geq 0, \text{ where 'k' is any constant.} \end{aligned}$$

9. Solve the following non-linear programming problem by using the Lagrange's multiplier method: Optimize $Z = x_1^2 + x_2^2 + x_3^2$

$$\begin{aligned} \text{Subject to } 4x_1 + x_2^2 + 2x_3 &= 14 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

1. For the following statement give the conclusion follows logically

Statements: All green are blue.

All blue are white.

Conclusions:

- A. Some blue are green.
 - B. Some white are green.
 - C. Some green are not white.
 - D. All white are blue.
2. Solve the following
- A. Find the unit digit of $(4137)^{754}$
 - B. Find which of the following number is divisible by 11?
 - C. Find the least common multiple of the numbers 12, 18, 24 in set of integers.
3. For the following statement give the conclusion follows logically
- Statements:
- No door is dog.
- All the dogs are cats.
- Conclusions:
- A. No door is cat.
 - B. No cat is door.
 - C. Some cats are dogs.
 - D. All the cats are dogs.
4. For the following statement give the conclusion follows logically
- Statements: All the locks are keys. All the keys are bats. Some watches are bats.
- Conclusions:
- A. Some bats are locks.
 - B. Some watches are keys.
 - C. All the keys are locks.
5. For the following statement give the conclusion follows logically
- Statements:
- Some ants are parrots.
- All the parrots are apples
- Conclusions:
- A. All the apples are parrots.
 - B. Some ants are apples.
6. For the following statement give the conclusion follows logically
- Statements:
- All the phones are scales.
- All the scales are calculators.
- Conclusions:
- A. All the calculators are scales.
 - B. All the phones are calculators
 - C. All the scales are phones.

D. Some calculators are phones.

7. The probability that machine A will be performing a usual function in 5 years time is $\frac{1}{4}$, while the probability that machine B will be operating usually at the end of the same period is $\frac{1}{3}$. Find the probability in the following cases that in 5 years time:

- (i) Both machines will be performing a usual function
- (ii) Neither will be operating
- (iii) Only machine B will be operating
- (iv) At least one of the machines will be operating

8. Two cards are drawn at random from a pack of 52 cards. What is the probability that either both are black or both are queens?

9. Two dice are thrown together. What is the probability that the sum of the numbers on the two faces is divisible by 4 or 6?

10. Dev can hit a target 3 times in 6 shots Pawan can hit the target 2 times in 6 shots and Lakhan can hit the target 4 times in 4 shots. What is the probability that at least 2 shots hit the target?

There are three boxes I, II, and III. Box I contains 4 red, 5 Blue and 6 white balls. Box II contains 3 red, 4 blue and 5 white balls. Box III contains 5 red, 10 blue and 5 white balls. One box is chosen and one ball is drawn from it. What is the probability that

- i. Red ball is drawn
- ii. Blue ball is drawn
- iii. White ball is drawn

11.

In a certain college 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the students. If a student is selected and is found to be studying Mathematics find the probability that the student is a

- i. Girls
- ii. Boy.

12.

Companies A, B, C produce 30%, 45%, 25% of the cars respectively. It is known that 2%, 3% and 2% of these cars produced from A, B, C are defective.

- i. What is the probability that a car purchased is defective
- ii. If a car purchased is found to be defective what is the probability that this car produced by the company A.

13.

The students in a class are selected at random one after the other for an examination. Find the probability that the boys and girls are alternate if there are

- i. 5 boys and 4 girls
- ii. 4 boys and 4 girls