

F.Y. BSc-IT
SEMSTER-2

NUMERICAL AND STATISTICAL METHOD.

[Time: 2 1/2 Hours]

12/3/20

[Marks: 75]

NOTE:

- > All questions are compulsory.
- > Figures to the right indicate marks.
- > Use of calculator is allowed.



Q. 1. Attempt any three from the following:

[5X3=15]

- A. Explain mathematical modelling.
- B. What is conservation laws and also give an example.
- C. A bungee jumper with a mass of 68.1 kg leaps from a stationary hot air balloon (the drag coefficient is 0.25 kg/m). Compute the velocity for the first 12s of free fall. Also determine the terminal velocity that will be attained for an infinite long cord.
- D. Distinguish between accuracy and precision.
- E. Find an absolute error and relative error of $f(x) = x^3 - 2x + 5$ for value of x as 1.2351 where true value of x is 1.2351234.
- F. Find relative error and percentage error of $f(x) = x^2 + 5$ for value of x as 0.024 where true value of x is 0.02458791.

Q. 2 Attempt any three from the following:

[5X3=15]

- A. Obtain the root correct to 2 decimal places for equation $3x^3 + 5x - 40 = 0$ using bisection method.
- B. Using regula falsi method find root of equation $x^3 - 2x - 5 = 0$. Perform 4 iterations.
- C. Solve equation $x \sin x + \cos x = 0$, using newton raphson method.
- D. Find the equation of the cubic curve that passes through the points (0,-5), (1, 10), (2, -9), (3, 4) and (4, 35) using newton's forward difference interpolation formula.
- E. Prepare backward difference table for $f(x) = x^3 + 2x + 7$, $x = 0(2) 10$
- F. Use lagrange's interpolation formula to find the value of x when $y = 20$ and $y = 40$ using following data.

X	1	2	3	4
Y	1	8	27	64

Q. 3. Attempt any three from the following:

[5X3=15]

- A. Solve the following equations using gauss jordan
 $4x + 3y + 3z = 20$, $3x + 2y + z = 13$, $x + y + z = 6$.
- B. Solve using gauss seidal method
 $5x - y = 9$, $-x + 5y - z = 4$, $-y + 5z = -6$.
- C. Use Simpson's 3/8th rule to evaluate integral $\int_0^{\pi} \sin x \, dx$ by dividing $(0, \frac{\pi}{2})$ into 9 intervals.
- D. Estimate integral $\int_0^1 \frac{1}{1+x} \, dx$, using trapezoidal rule for (a) $h = 1/4$ and (b) $1/2$.
- E. Use Taylor's series method to approximate $y(2.1)$ if $dy/dx = x-y$ and $y(2) = 2$. Correct up to 5 decimal places.
- F. Use Euler's method to estimate $y(0.5)$ of equation $dy/dx = x + y + xy$, with $h=0.25$ and $y(0)=1$.

Q. 4. Attempt any three from the following:

[5X3=15]

A. If two regression equations are $2x-5y+16=0$ and $4x-8y=24$. Find mean values of x and y and also find correlation coefficient of x and y .

B. Fit a second degree polynomial to the following data:

X	0	1	2	3	4	5
Y	2.1	7.7	13.6	27.2	40.9	61.1

C. Find a linear regression equation of y on x for the following:

X	1	2	3	4	5	6
Y	12	9	6	2	11	5

D. Production of a certain chemical mixture should contain 80 mg chlorides, 28 mg nitrates and 36 mg of sulphates per kilogram. The company can use two substances and a base (assume this is costless). Substance X contains 8 mg chlorides, 4 mg nitrates and 6 mg sulphate per gram. Substance Y contains 10 mg chlorides, 2 mg nitrates and 2 mg sulphate per gram. Both substances cost Rs.20 per gram. It is required to produce the mixture using substances X and Y so that the cost is minimised. Formulate as LPP to minimize total profit.

E. Solve the following LPP graphically:

Minimise $z = 25x + 45y$

Subject to : $x+y \geq 20$, $2x+y \geq 10$, $3x+5y \geq 15$, $x, y \geq 0$

F. Solve the following LPP graphically:

Maximize: $z = 400x + 300y$

Subject to: $2x + 5y \leq 280$, $x + y \leq 200$, $x, y \geq 0$

Q. 5. Attempt any three from the following:

[5X3=15]

A. From a lot of 10 items containing 3 defectives, a sample of 4 item is drawn at random. Let the random variable X denote the number of defective items in a sample. Find probability distribution of X . Also find $P[X \leq 1]$ and $P[0 < X < 2]$

B. Define discrete random variable and probability distribution of random variable.

C. A fair dice is rolled until 6 appears. What is expected number of tosses?

D. If a random variable $X \rightarrow U(n)$ $E(x) = 10$ then find n . Also find $\text{Var}(X)$.

E. A uniform cubic die is rolled. If X is random variable denoting a number on upper most face of die. Find Probability distribution function X and hence find it's mean variance.

F. State two features of discrete uniform distribution.
