

- N.B.:** (1) All questions are compulsory.
 (2) Make suitable assumptions wherever necessary and state the assumptions made.
 (3) Answer to the same questions must be written together.
 (4) Numbers to the right indicate marks.
 (5) Draw neat labeled diagrams wherever necessary.
 (6) Use of Non-programmable calculators is allowed.

1. Attempt any **THREE** the following.

[15]

- (a) If true value of $x = 1.732$ and approximate value of $x = 1.73$ and $z = x_3 + x_2 - 1$. Then find the absolute, relative and percentage error in calculation of z .
 (b) Write the analytical solution of falling parachutist problem.
 (c) Short note on : Total Numerical Errors.
 (d) Use Taylor series expansion where $n = 0$ to 3 to approximate $f(x) = \cos x$ at $x_{i+1} = \frac{\pi}{3}$ on the basis of the value of $f(x)$ and its derivatives at $x_i = \frac{\pi}{4}$.
 (e) Find the round off error in storing the number 848.9735 using a four digit mantissa.
 (f) Short note : Conservation laws and engineering problems.

2. Attempt any **THREE** the following.

[15]

- (a) Define the relation between E and Δ where E is shift operator and Δ is forward difference operator. Hence, find $\Delta^2(x^2)$ take $h = 1$.
 (b) Find the missing term in the following table :

x	0	1	2	3	4
y	1	3	9	-	8

- (c) Using bisection method find $\sqrt{30}$ approximately by performing 2 iterations.
 (d) For the following data calculate $f(0.25)$ using newton's interpolation formula.

x	0.1	0.2	0.3	0.4	0.5
f(x)	1.4	1.56	1.76	2.00	2.28

(e) Given the following table.

x	1	2	5	9
y = f(x)	1	3	6	10

Find $f(6)$ using Lagrange's Interpolation formula.

- (f) Solve the equation using Regula-Falsi method $\cos x - xe^x = 0$ by performing two iterations.

3. Attempt any **THREE** the following.

[15]

(a) Use Gauss Jordan method to solve the following equation.

$$\begin{aligned} 2x_1 + 3x_2 - 4x_3 &= 1 \\ 5x_1 + 9x_2 + 3x_3 &= 17 \\ -8x_1 - 2x_2 + x_3 &= -9 \end{aligned}$$

(b) Use Runge-kutta second order formula to find $y(0, 2)$. Taking $h = 0.2$ Given that $y(0) = 0$ and $\frac{dy}{dx} = 1 + y^2$.

(c) Use Trapezoidal rule to evaluate $\int_0^1 x^3 dx$. Considering fine sub-intervals.

(d) Find the solution of the following system using Gauss Seidel Method. (perform two iteration only)

$$\begin{aligned} 2x_1 + x_2 + x_3 &= 5 \\ 3x_1 + 6x_2 + 2x_3 &= 15 \\ 2x_1 + x_2 + 4x_3 &= 8 \end{aligned}$$

(e) Find $\frac{dy}{dx}$ at $x = 6$ given that

x	4.5	5.0	5.5	6.0	6.5	7.0	7.5
y	9.69	12.9	16.71	21.18	26.37	32.34	39.15

(f) Use Taylor series method, for the equation $\frac{dy}{dx} = x^2y$ and $y(1) = 1$ to find the value of y at $x = 1.1, h=0.1$

4. Attempt any **THREE** the following.

[15]

(a) Calculate linear regression coefficient from the following data.

x	1	2	3	4	5	6	7	8
y	3	7	10	12	14	17	20	24

(b) By the method of last sequences, fluid the straight line that best fits the following data.

x	1	2	3	4	5
y	14	27	40	55	68

(c) Diet for a sick person must contain atleast 4000 units of vitamin, 50 units of minerals and 1500 calories. Two foods F_1 and F_2 cost Rs. 50 and Rs. 75 per unit respectively. Each unit of food (F_1) contains 200 units of vitamins, 1 unit of minerals and 40 calories, whereas each unit of food F_2 contains 100 units of vitamins, 2 units of minerals and 30 calories. Formulate the L.P.P to satisfy sicker person's requirement at minimum cost.

(d) Solve graphically following LPP

$$\begin{aligned} \text{Minimise } z &= 3x + 8y \\ \text{Subject to } 3x + 10y &\geq 150 \\ 4x + 5y &\geq 150 \\ x, y &\geq 0 \end{aligned}$$

(e) The regression equation calculated from a set of observations for 2 variables are

$$x = -0.4y + 6.4$$

$$y = -0.6x + 4.6$$

Find i) \bar{x} ii) \bar{y} iii) r .

(f) Fit a least square quadratic curve to the following data estimate $y(2 \cdot 4)$

x	1	2	3	4
y	1.7	1.8	2.3	3.2

5. Attempt any **THREE** the following.

[15]

(a) If random variable x follows exponential distribution with parameter 0.5 find

(i) mean (ii) variance (iii) find 'a' such that $P(x > a) = 0.4$.

(b) IF $z \sim N(0, 1)$ find

(i) $P(z > 2.53)$

(ii) $P(z < -1.04)$

(iii) $P(-1.38 < z < 1.21)$

(iv) $P(-2.12 < z < -2.08)$

(c) The probability mass function of random variables x is given by..

$$\begin{aligned} P(X = x) &= \frac{1}{8} & \text{If } x &= 0 \\ &= \frac{1}{4} & \text{If } x &= 1, 2, 3 \\ &= \frac{1}{8} & \text{If } x &= 4 \end{aligned}$$

Find : (i) $P(x \leq 1)$ (ii) $P(x > 3)$ (iii) $P(1 < x \leq 3)$

(d) Find the probability that at the most 5 defective bolts will be found in a box of 200 bolts, if it is known that 2 percent of such bolts are expected to be defective (given that $e^{-4} = 0.0183$)

(e) Fit a binomial distribution for the following data and hence find the expected frequencies.

x	0	1	2	3	4
F	5	29	36	25	5

(f) If x is a normal variable using $P(x < 60) = 0.4$ and $P(x > 80) = 0.2$. Find mean and variance of x .

Paper Discussion Schedule for all Subjects: F.Y.B.Sc.IT (Sem. II)

Date	Day	Timing	Centre
11 April. 2017	Tuesday	9.00 a.m. to 11.00 a.m.	Dadar
11 April. 2017	Tuesday	12.00 p.m. to 2.00 p.m.	Andheri
12 April.2017	Wednesday	9.00 a.m. to 11.00 a.m.	Thane
12 April.2017	Wednesday	12.00 p.m. to 2.00 p.m.	Ghatkopar
13 April.2017	Thursday	3.00 p.m. to 5..00 p.m.	Kalyan

