

**Note:** Attempt all five questions. Assume suitable data if any misprint missing data.

**Q.I.** Objective types questions/Short answer type questions-

(i) Iterative formula to find N is-

$$(a) \frac{1}{2} \left( xu + \frac{N}{xn} \right) \quad (b) \frac{1}{3} \left( xn + \frac{N}{xn} \right)$$

$$(c) \frac{1}{2} \left( xn + \frac{\sqrt{N}}{xn} \right) \quad (d) \frac{1}{3} \left( xn + \frac{\sqrt{N}}{xn} \right)$$

(ii) Find the missing value of the given data-

x:	1	2	3	4	5
f(x):	7	-	13	21	37

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(iii) If  $\int_1^{\pi} \frac{1}{1+x^2} dx = 0.785395$  then find the value of  $\pi$  by using it.

(iv) The Range-Kutta second order method is also known as-

- (a) Picard method (b) Euler method  
(c) Euler Modified method  
(d) Improved Euler method

(v) Write the formula of Karl Pearson's coefficient of correlation.

**Note:** Attempt any three parts from question 2 to 6. (each of 5 marks)

**Q.II.(a)** Using Bisection method find a root of the equation  $x^3 - 4x - 9 = 0$  in four stages.

(b) Evaluate  $\sqrt{12}$  to four decimal place by Newton's Iterative method.

(c) Using Newton Raphson's method find the real root of the equation  $3x = \cos x + 1$

(d) Solve the equations by Gauss-elimination method  $3x + y - z = 3$ ,  $2x - 8y + z = -5$  and  $x - 2y + 9z = 8$

**Q.III(a)** The population of a town is as follows:

Year	1921	1931	1941	1951	1961	1971
Population (in lakhs)	20	24	29	36	46	51

Estimate the increase in population during the period 1955 to 1961.

(b)  $f(20) = 24, f(24) = 32, f(28) = 35, f(32) = 40$ , find the value of  $f(25)$  by Basset's formula.

(c) Find the unique polynomial  $P(x)$  of degree such that  $P(1) = 1$ ,  $P(3) = 27, P(4) = 64$ .

(d) Apply Newton's divided difference formula to find the value of  $f(8)$  if  $F(1) = 3, f(3) = 31, f(6) = 223, f(10) = 1011$  and  $f(14) = 1343$ .

**Q.IV(a)** Find  $f(4)$  from the following data-

X:	0	2	5	1
F(x)	0	8	125	1

(b) Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  by using Simpson's both rule. Also find the value of  $\pi$  in each cases.

- (c) Evaluate  $\int_0^1 \frac{dx}{1+x}$  by dividing the interval of integration into 8 equal parts. Hence find  $\log_e 2$  approximately.
- (d) Evaluate  $\int_4^5 x^{-2} \log_e x dx$  by using Weddl's rule.

Q.V.(a) Solve  $\frac{dy}{dx} - x + y$   $y(0) = 0$  changing the step length 0.2 for  $y(1.2)$  by Euler's method.

(b) Using Record's method obtain the value of  $y$  for  $x = 0.2$  correct to five places of decimal. Give  $\frac{dy}{dx} = x - y$  with  $y(0) = 1$ .

(c) Using Taylor's series method to obtain approximate value of  $y$  at  $x = 0.2$  for the differential equation  $\frac{dy}{dx} = 2y + 3e^x$  with  $y(0) = 0$ .

(d) Using Runge Kutta method to find  $y$ , when  $x = 1.2$  in step of 0.1 give that when  $x = 1.2$   $M$  step of 0.1 give that  $\frac{dy}{dx} = x^2 + y^2$  and  $y(1) = 1.5$

Q.VI(a) Find the correlation coefficient and the equations of regression lines for the following values of  $X$  only-

$x$	1	2	3	4	5
$y$	2	5	3	8	7

(b) From the following data regression equation

$$8x - 10y + 66 = 0$$

$$40x - 18y = 214$$

$$\text{and } \sigma_x = 3$$

find-

(i) mean value of  $x$  and 4.

(ii)  $\sigma_4$

(iii) Coefficient of correlation.

(c) Find the coefficient of correlation for the following table-

$X$	10	14	18	22	26	30
$Y$	18	12	24	6	30	36

(d) In a partially destroyed lab, only the equation of regressions  $7x - 16y + 9 = 0$  and  $5y - 4x - 3 = 0$  are available find  $\bar{x}$ ,  $r$  and  $\bar{y}$ .