

[Time:2.30 Hrs]

[ Marks:75 ]

Please check whether you have got the right question paper.

- N.B:
1. All question are compulsory.
  2. Figures to the right indicate full marks.
  3. Students answering in the regional language should refer in case of doubt to the main text of the paper in English.

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

- A To travel 500 kms if 50 liters of petrol is required. How much petrol is needed to go to a place which is 200 kms away? 5
- B Suppose 1.414 is used as an approximation to  $\sqrt{2}$ . Find the absolute, relative and percentage errors. 5
- C Find The value of  $f(6)$  given that  $f(4) = 125, f'(4) = 74, f''(4) = 30, f'''(4) = 6$  and all other higher derivative of  $f(x)$  at  $x = 4$  zero. 5
- D Define the following terms with one example: 5
- i) Accuracy ii) Inherent errors
- E For  $f(x) = \sin x$  taking  $x = \frac{\pi}{2}$  using Taylor's series find the value of  $f(2)$ . 5
- F Find the percentage error if 625.483 is approximated to three significant figures. 5

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

- A Find the approximate root of the equations  $x^3 - 5x + 1 = 0$  by performing 3 iteration using Bisection method. 5
- B Using Newton Raphson method to find iterative formula to get square root of a number  $x$ . 5
- C Using Secant Method, find the root of  $f(x) = \cos x - xe^x = 0$  taking the initial approximations as 0 and 1. 5
- D Find the unique polynomial  $P(x)$  such that  $P(3) = 1, P(4) = 2$  and  $P(5) = 4$  using Lagrange interpolation. 5
- E Explain difference between forward and backward difference operators. 5

- F Construct the divided difference table for the given data and hence find the interpolating polynomial. 5

x	0.5	1.5	3.0	5.0	6.5	8.0
F(x)	1.625	5.875	31	131	282.125	521

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

- A Solve the equation:  $x + 4y - z = 6$ ,  $6x + y + z = 20$ ,  $x - y + 5z = 7$  by using Gauss-Seidel Method. 5

- B Using the Euler's method to solve the following equation: 5

Given that  $\frac{dy}{dx} = x^2 + y$  with  $y(0) = 1$  take  $h = 0.05$  find  $y(0.1)$ .

- C Using following table find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at  $x = 1.2$  5

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

- D Using the Runge-Kutta's 2<sup>nd</sup> order method to solve the following equation: 5  
Given that  $\frac{dy}{dx} = x - y$  with  $y(0) = 1$  take  $h = 0.1$  find  $y(0.2)$ .

- E Evaluate  $\int_0^6 \frac{1}{1+x} dx$  with  $n = 6$  by Simpson's 1/3<sup>rd</sup> rule. 5

- F Solve the system  $6x + y + z = 20$ ,  $x + 4y - z = 6$ ,  $x - y + 5z = 7$  using Gauss-Jordan Method. 5

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

- A A bakery produces two type of cakes I and II using raw materials  $R_1$  and  $R_2$ . One cake of type I is produced by using 4 units of raw material  $R_1$  and 6 units of raw material  $R_2$  and one cake of type II is produced by using 5 units of raw material  $R_1$  and 9 units of raw material  $R_2$ . There are 320 units of  $R_1$  and 540 units  $R_2$  in the stock. The profit per cake of type I and type II is Rs. 200 and Rs. 250 respectively. How many cakes of type I and type II be produced so as to maximize the profit? formulate the L.P.P. 5

- B Solve the following LPP graphically, 5

Minimize  $Z = 25x + 10y$  subject to  $10x + 2y \geq 20$ ,  $x + 2y \geq 6$ ,  $x \geq 0$ ,  $y \geq 0$ .

- C Explain the following term of L.P.P. 5
- i) Objective function, ii) Feasible solution.
- D Given the two regression lines as  $x - 4y = 5$  and  $x - 16y = -64$ , find the average of x and y and correlation coefficient between x and y. 5
- E What is mean by regression? Write the properties of linear regression. 5
- F Obtain a regression plane by using multiple regression to fit the following data 5

X	0	1	2	3	4
Y	13	17	19	21	26
Z	1	2	3	4	5

### Q.5 Attempt any THREE of the following

- A A pair of fair dice is thrown and sum of numbers on the uppermost faces is noted. Find its probability distribution (p.m.f.). 5
- B 20 wrist watches in a box of 100 are defective. If 10 watches are selected at random, find the probability that (i) 10 are defective (ii) at least one watch is defective. 5
- C A random variable is number of tails when a coin is tossed three times. Find expectation (mean) of the random variable. 5
- D If 2% of electric bulbs manufactured by a certain company are defective. Find the probability that in a sample of 200 bulbs i) less than 2 bulbs ii) more than 3 bulbs are defective. [e-4 = 0.0183] 5
- E Write the properties of normal distribution. 5
- F Students of a class were given an aptitude test. Their marks were found to be normally distributed with mean 60 and standard deviation 5. What percentage of students scored between 45 and 65 marks 5

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