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Question Paper Code	12415
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**B.E. / B.Tech - DEGREE EXAMINATIONS, NOV / DEC 2023**

Fourth Semester

**Civil Engineering**

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Mechanical Engineering & Mechanical and Automation Engineering)

**20BSMA403 - STATISTICS AND NUMERICAL METHODS**

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

- |  | <i>Marks,<br/>K-Level, CO</i> |
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| 1. State the application of Chi - square test.   | <i>2,K1,CO1</i>               |
| 2. What are the uses of F-distribution?  | <i>2,K1,CO1</i>               |
| 3. What are the advantages of a Latin square design?   | <i>2,K2,CO2</i>               |
| 4. Define Randomized block design.   | <i>2,K1,CO2</i>               |
| 5. Solve the system of equations by Gauss Jordan method<br>$2x+y=3$ ; $7x-3y=4$ .  | <i>2,K1,CO3</i>               |
| 6. What is the condition of convergence for Newton Raphson method?   | <i>2,K1,CO3</i>               |
| 7. What are the errors in Trapezoidal and Simpson's rule?  | <i>2,K1,CO4</i>               |
| 8. Write down the expression for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = x_0$ using Newton's forward difference formula. | <i>2,K2,CO4</i>               |
| 9. Using Taylor series method find $y$ at $x = 0.1$ if $\frac{dy}{dx} = x^2y - 1, y(0) = 1$ .                                    | <i>2,K2,CO5</i>               |
| 10. State Adams – Bashforth predictor and corrector formula.   | <i>2,K2,CO5</i>               |

**PART - B (5 × 16 = 80 Marks)**

Answer ALL Questions

11. a) A sample of 900 members has a mean 3.4 cm and standard deviation 2.61 cm. Is the sample from a large population of mean 3.25 cms and standard deviation of 2.61 cms? *16,K2,CO1*

**OR**

- b) Theory predicts that the proportion of beans in four groups A,B,C,D should be 9:3:3:1. In an experiment among 3200 beans, the numbers in the four groups were 882,313,287 and 118. Does the experiment support the theory? *16,K2,CO1*

12. a) The following data give the yields of 12 plots of land in three samples, each of plots, under varieties of fertilizers A, B and C. 16,K3,CO2

A	B	C
25	20	24
22	17	26
24	16	30
21	19	20

Is there any significant difference in the average yields of land, under the three varieties of fertilizers?

**OR**

- b) The following data resulted from an experiment to compare three burners C<sub>1</sub>, C<sub>2</sub>, and C<sub>3</sub>. Use the Latin design to test the hypothesis that there is no difference between the burners. 16,K3,CO2

	Machine-1	Machine-2	Machine-3
Day-1	C <sub>1</sub> -16	C <sub>2</sub> -17	C <sub>3</sub> -20
Day-2	C <sub>2</sub> -16	C <sub>3</sub> -21	C <sub>1</sub> -15
Day-3	C <sub>3</sub> -15	C <sub>1</sub> -12	C <sub>2</sub> -13

13. a) (i) Solve the following system by Gauss-Elimination method 8,K3,CO3  
 $3x - y + 2z = 12$  ;  $x + 2y + 3z = 11$  ;  $2x - 2y - z = 2$ .  
 (ii) Using Newton's method, find the root between 0 and 1 of  $x^3 = 6x - 4$  correct to 5 decimal places. 8,K3,CO3

**OR**

- b) Solve by Gauss-Seidel Methods  $10x - 5y - 2z = 3$ ;  $4x - 10y + 3z = -3$ ;  $x + 6y + 10z = -3$ . 16,K3,CO3

14. a) The population of a certain town is shown in the following table; find the rate of growth of the population in 1931 and 1971. 16,K4,CO4

Year	1931	1941	1951	1961	1971
Population in lakhs	40.62	60.80	79.95	103.56	132.65

**OR**

- b) Evaluate  $\int_0^6 \frac{dx}{1+x}$  using Trapezoidal rule and Simpson's rule. Also check up the results with actual integration. 16,K4,CO4

15. a) Using Runge-Kutta method of 4<sup>th</sup> order, solve  $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$  with  $y(0) = 1$  at  $x = 0.2$ . 16,K4,CO5

**OR**

- b) Solve Crank-Nicolson method to solve  $u_{xx} = u_t$  given  $u(0,t) = u(x,0) = 0$ ,  $u(1,t) = t$ , for two time steps. 16,K4,CO5