

2014

Time : 3 hours

Full Marks: 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from **all** the Groups as directed.

Group – A**(Compulsory)**

1. [A] State whether the following statements are 'True' or 'False':

1x5=5

- a) The ratio of standard deviation to the mean is known as the co-efficient of variation.
- b) Newton's method is useful in cases of large values of $f(x)$.
- c) The convergence in the Gauss-Seidal method is twice as fast as in Jacobi's method.
- d) Truncation errors are caused by using appropriate result or on replacing an infinite process by a finite one.
- e) Interpolation is the technique of estimating the value of a function for any intermediate value of the variable.

[B] Select the correct answers:

1 x 10 = 10

- a) The order of convergence in Newtons-Raphson's method is:
 - a. 0

b. 1

c. 2

d. 3

b) A solving simultaneous equation by Gauss-Jordan's method the co-efficient matrix is reduced to _____ matrix.

a. Upper triangular

b. Lower triangular

c. Diagonal matrix

d. None of the above

c) Bessel's formula is more appropriate when p lies between:

a. 0.75 and 1.00

b. 0.25 and 0.75

c. -0.25 and 0.25

d. 2.00 and 3.00

d) Taylor's series method will be useful to give some _____

a. Starting values

b. Ending values

c. Continues value

d. None of the above

e) _____ method is based on the repeated application of the intermediate value property.

a. Bisection method

b. Regula-Falsi method

c. Sicant method

d. None of the above

f) Using Euler's method $\frac{dy}{dx} = \frac{(y-2x)}{y}$. $Y(0) = 1$; gives $y(0.1) =$

a. 1.34

b. 1.18

c. 1.75

d. 2.5

g) The Newton-Raphson method fails when _____

a. $f(x)$ is negative

b. $f(x)$ is too large

c. $f(x)$ is zero

d. Never fails

h) The curve of best fit is that for which e 's are as _____ as possible. i.e. the sum of the squares of the error is a minimum.

a. Large

b. Small

c. Regular

d. Non-regular

i) Stirling's formula is best suited for p lying between _____

a. 0.75 and 1.00

b. 0.25 and 0.75

c. -0.25 and 0.25

d. 2.00 and 3.00

j) The distribution related to the probabilities of events which are extremely rare, but which have a large number of independent opportunities for occurrence.

a. Normal

b. Poisson

c. Binomial

d. None of the above

Group – B

Answer any **five** questions:

4x5=20

2. Find the root of the equation $x e^x = \cos x$ using the Regula-Falsi method, correct to four decimal places.
3. Find a root of the equation $x^3 - 2x - 5 = 0$ using secant method.
4. Explain Simpson's $1/3^{\text{rd}}$ rule.
5. Find the Taylor's series method, the value of y at $x = 0.1$ and $x = 0.2$ to five decimals from $\frac{dy}{dx} = x^2 + y - 1, y(0) = 1$.
6. If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2,000 individuals more than two will get a bad reaction.
7. What is numerical computational error? Explain absolute, relative and percentage error.
8. Using Picard's method, solve $\frac{dy}{dx} = -xy$ with $x_0 = 0, y_0 = 1$ upto third approximation.

Group – C

Answer any **five** questions:

7x5=35

9. Solve the following equations by Gauss-Jordan's method:

$$10x - 7y + 3z + 5u = 6$$

$$-6x + 8y - z - 4u = 5$$

$$3x + y + 4z + 11u = 2$$

$$5x - 9y - 2z + 4u = 7$$

10. Using Newton's forward interpolation formula, show that

$$\sum n^3 = \left\{ \frac{n(n+1)}{2} \right\}^2 .$$

11. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using:

- a) Trapezoidal Rule
 - b) Simpson's $1/3^{\text{rd}}$ rule
12. What do you understand by Dispersion? Explain important measures of dispersions. Also explain relationship between the following:
- a) Quartile deviation and Standard deviation
 - b) Mean deviation and Standard deviation
13. Apply Runge-Kutta method to find approximate value of y for $x = 0.2$ in steps of 0.1 if $\frac{dy}{dx} = x + y^2$ given that $y = 1$, where $x = 0$.
14. Solve the following equation by Gauss-Seidal method:
- $$20x + y - 2z = 17$$
- $$3x + 20y - z = -18$$
- $$2x - 3y + 20z = 25$$
15. Explain any **one** of the following:
- a) Newton-Cotes formula
 - b) Weddel's Rules
 - c) Least square curve fitting method

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