

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2019
(Second Semester)

Branch – STATISTICS

NUMERICAL METHODS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 x 1 = 10)

- 1 $\Delta(\text{Constant}) = 0$.
(i) 0 (ii) 1
(iii) 2 (iv) ∞
- 2 The relationship between the operators Δ and E is .
(i) $E = 1 - \Delta$ (ii) $E = \Delta - 1$
(iii) $E = 1 + \Delta$ (iv) $E = \Delta$
- 3 Which of the following is a central difference operator?
(i) Δ (ii) μ
(iii) δ (iv) E
- 4 Gauss's formula (forward) is useful when
(i) $0 < n < \infty$ (ii) $0 < n < 1$
(iii) $-1 < n < 0$ (iv) $-\frac{1}{2} < n < \frac{1}{2}$
- 5 In numerical differentiation, the rounding error is ___ proportional to h
(i) directly (ii) inversely
(iii) equal (iv) None
- 6 In Simpson's $\frac{1}{3}$ rule the interval of integration must be divided into ___
number of sub intervals of width h
(i) an even (ii) an odd
(iii) minimum (iv) Maximum
- 7 Which of the following is an algebraic equation?
(i) $x \log_{10} x - 1.2 = 0$ (ii) $x = \frac{1}{2} + \sin x$
(iii) $x^3 - 3x + 1 = 0$ (iv) $e^x = 4^x$
- 8 Newton's – Raphson method is also referred to as the method of
(i) Secants (ii) Cosecants
(iii) Tangents (iv) None
- 9 To get more accurate result the terms in Taylor formula to be
(i) Increased (ii) Decreased
(iii) Constant (iv) None
- 10 A Corrector formula is used to improve the value of
(i) x_{n+1} (ii) x_{n-1}
(iii) y^{n+1} (iv) y_{n-1}

Cont...

SECTION - B (25 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 5 = 25)

11 a Prove that $E \nabla = \nabla E = \Delta$.

OR

b Estimate the missing value from the following data

X :	0	1	2	3	4
Y :	1	3	9	-	81

12 a Derive Bessel's formula.

OR

b From the following table find $y(35)$ by using Stirling's formula.

X :	20	30	40	50
Y :	512	439	346	243

13 a Write a brief note on numerical differentiation.

OR

b Compute the value of the definite integral $\int_4^{5.2} \log_e x \, dx$ using Simpson's $\frac{1}{3}$ rule.

14 a State the important properties of transcendental equations.

OR

b Using Newton's - Raphson's method find the smallest positive root of the equation $x^3 - 2x + 0.5 = 0$.

15 a Describe Euler's method.

OR

b Solve the equation $y'' + y = 0$ with the conditions $y(0) = 1$ and $y'(0) = 0$. Compute $y(0.2)$ using Runge - kutta method.

SECTION - C (40 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 8 = 40)

16 a State and prove fundamental theorem of finite differences.

OR

b Find $f(1)$ and $f(5)$ using Newton's divided difference formula from the following data

X :	0	2	3	4	7	8
Y=f(x) :	4	26	58	112	466	668

17 a Using Gauss's forward formula find $f(3.75)$ from the following table.

X :	2.5	3.0	3.5	4.0	4.5	5.0
Y=f(x) :	24.145	22.043	20.225	18.644	17.262	16.047

OR

b Find the age corresponding to the annuity value 13.6 from the given table.

Age (x) :	30	35	40	45	50
Annuity Value (Y) :	15.9	14.9	14.1	13.3	12.5

- 18 a Find first and second derivatives of the function tabulated below at the point $X=1.5$

X:	1.5	2.0	2.5	3.0	3.5	4.0
F(x):	3.375	7.0	13.625	24.0	38.875	59.0

OR

- b Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Trapezoidal rule with $h = 0.2$. Hence determine the value of Π .

- 19 a State and prove the sufficient condition of iterations.

OR

- b Find the root of $x e^x = 3$ by Regula -Falsi method correct to three decimal places.

- 20 a Solve $\frac{dy}{dx} = y + e^x$, $y(0)=0$, for $x=0.2, 0.4$ by using Euler's method.

OR

- b Given $\frac{dy}{dx} = 3x + \frac{y}{2}$ and $y(0) = 1$. Find the values of $y(0.1)$ and $y(0.2)$ using Taylor's Series methods.

Z-Z-Z

END