PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 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 The forward difference operator Δ is defines by
(i) $\Delta f(x)=f(x)-f(x+h)$ (ii) $\Delta f(x)=f(x+h)-f(x)$
(iii) $\Delta f(x)=f(x)+f(x+h)$ (iv) $\Delta f(x)=f(x+h)+f(x)$

2 The process of computing the value of a function outside the given range is
(i) Interpolation (ii) Extrapolation
(iii) Central difference (iv) None of these

3 Which of the following is not a central difference method?
(i) Gauss (ii) Bessel (iii) Sterling (iv) Newton

4 When the values of x are not equally spaced then _____ formula gives good result for inverse interpolation.
(i) Newton's (ii) Lagrange's (iii) Gauss's (iv) Sterling's

5 In Trapezoidal rule, the accuracy of the result can be improved by
(i) increasing the interval 'h' (ii) decreasing the interval 'h'
(iii) constant 'h' (iv) None of these

6 In numerical differentiation, the rounding error increases as 'h'
(i) Increases (ii) Decreases (iii) Constant (iv) None of these

7 Simpson's $3/8$ rule can be applied only if the umber of sub intervals is a multiple of
(i) 3 (ii) 8 (iii) 11 (iv) 24

8 3x-cosx-1=0 is an example for
(i) Algebric equations (ii) Transcendental equations
(iii) Ordinary equations (iv) Simultaneous equations

9 The iteration process converges quickly if
(i) $|\phi'(x)|=0$ (ii) $|\phi'(x)|=1$ (iii) $|\phi'(x)|<0$ (iv) $|\phi'(x)|>0$

10 To use Milne's predictor – corrector formula we need atleast _____ values prior to the required value.
(i) 2 (ii) 3 (iii) 4 (iv) 5

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

11 a Evaluate $\Delta^{10}\{(1-ax)(1-bx^2)(1-cx^3)(1-dx^4)\}$.

OR

b Derive the Newton's forward interpolation formula.

12 a Derive Sterling's Central difference formula.

OR

b Using Gauss's forward formula find f(32) from the following table.

x	25	30	35	40
y=f(x)	0.2707	0.3027	0.3386	0.3794

13 a Write a note on (i) Truncation Error (ii) Rounding Error

OR

b Derive Trapezoidal rule.

14 a Describe Newton-Raphson method.

OR

b Find the real root of the equation $1-x+\frac{x^2}{(2!)^2}-\frac{x^3}{(3!)^2}+\frac{x^4}{(4!)^2}-....=0$ using iteration method.

15 a Derive Euler's formula.

OR

b Using Taylor's series method compute y(0.1) correct to 4 decimals place if y(x) satisfies $y'=x+y, y(0)=1$.

SECTION -C (40 Marks)

Answer **ALL** questions

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

16 a State and prove fundamentals theorem of finite differences.

OR

b Estimate the production for 1964 and 1996 from the following table.

Year (x)	1961	1962	1963	1964	1965	1966	1967
Production (y)	200	220	260	-	350	-	430

17 a From the following tables, using Stirling's formula, estimate the value of tan16°.

x	0	5°	10°	15°	20°	25°	30°
tan x	0.0	0.875	0.1763	0.2679	0.3640	0.4663	0.5774

OR

b Using Lagrange's inverse interpolation formula find the value of x when y=20 from the following table.

x	1	2	3	4
Y=f(x)	1	8	27	64

18 a Derive Simpson's $\frac{1}{3}$ rule formula.

OR

b Find the first and second derivatives of the function tabulated below at x=0.6

x	0.4	0.5	0.6	0.7	0.8
y	1.5836	1.7974	2.0442	2.3275	2.6511

19 a Find the real root of $e^x=4x$, correct to three decimal places.

OR

b Derive the formula for Regula-Falsi method.

20 a Solve $\frac{d^2y}{dx^2}-x\left(\frac{dy}{dx}\right)^2+y^2=0$ using Runge-Kutta method for x=0.2 correct to 4 decimal places. Initial conditions are x=0, y=1, $y'=0$.

OR

b The differential equation $\frac{dy}{dx}=y-x^2$ is satisfied by y(0)=1, y(0.2)=1.12186, y(0.4)=1.46820, y(0.6)=1.7379. Compute the value of y(0.8) by Milne's