PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2023
(Second Semester)

Branch – **STATISTICS**

NUMERICAL METHODS

Time: Thr :e Hours

Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 W hat is the order of convergence in Newton-Raphson method?
(i) 2 (ii) 3
(iii) 4 (iv) 1

2 Divided differences are useful when:
(i) Arguments are equally spaced
(ii) Arguments are unequally spaced
(iii) Arguments advance with unit intervals
(iv) Argument series are equally divided

3 The best results are obtained from laplace everett's formula when:
(i) $u \leq \frac{1}{3}$ and $v \geq \frac{1}{4}$ (ii) $u \leq \frac{1}{2}$ and $v \geq \frac{3}{4}$
(iii) $u \leq \frac{3}{4}$ and $v \geq \frac{1}{5}$ (iv) $u \leq \frac{3}{4}$ and $v \geq \frac{1}{4}$

4 In deriving the trapezoidal formulae, the arc of the curve y = f(x) over each sub-interval is replaced by its _____.
(i) straight line (ii) ellipse
(iii) chord (iv) tangent line

5 How many prior values are required to predict the next values in Milne's method?
(i) 4 (ii) 3
(iii) 2 (iv) 1

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Evaluate $\sqrt{142}$ using Newtons Raphson method.

OR

b Find the real root of the equation $x^3 + x^2 - 1 = 0$, by iteration method.

7 a Using Newton's forward interpolation formula, find the polynomial $f(x)$ satisfying the following data. Hence find $f(2)$.

x:	0	5	10	15
y:	14	379	1444	3584

OR

b Find $y(2.25)$ using Newton's backward difference formula from the following data:

x:	1.00	1.25	1.50	1.75	2.00
y:	0.3679	0.2865	0.2231	0.1738	0.1353

8 a Interpolate by means of Gauss backward formula, the population of a town for the year 1974, given that

x:	1939	1949	1959	1969	1979	1989
y:	12	15	20	27	39	52

OR

b Derive Bessel's formula.

Cont...

9 a Explain the Newton's forward difference formula to get the derivative.

OR

b Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $3/8^{th}$ rule.

10 a Using Euler's method find $y(0.2)$ and $y(0.4)$ from $\frac{dy}{dx} = x + y,\ y(0) = 1$ with $h = 0.2$.

OR

b State the special advantage of Runge-Kutta method over Taylor's method.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Using Horner's method find the root of the equation $2x^3 - 3x - 6 = 0$, correct to 3 decimal places.

OR

b Find the approximate root of $x\log_{10} x - 1.2 = 0$ by False position method

12 a The following table gives same relation between steam pressure and temperature. Find the pressure at temperature 372.1^0.

T:	361^0	367^0	378^0	387^0	399^0
P:	154.9	167.0	191.0	212.5	244.2

OR

b Using Lagrange's interpolation, calculate the profit in the year 2000 from the following data:

Year:	1997	1999	2001	2002
Profit in lakhs of Rs.:	43	65	159	248

13 a From the following table, estimate $e^{0.644}$ using Stirling's formula.

x	0.61	0.62	0.63	0.64	0.65	0.66	0.67
e^x	1.8404	1.8589	1.8776	1.8964	1.9155	1.9347	1.9542

OR

b Find the value of θ given $f(\theta) = 0.3887$, where $f(\theta) = \int_0^\theta \frac{1}{\sqrt{1-\frac{1}{2}\sin^2\theta}} d\theta$ using the following table.

θ :	21^o	23^o	25^o
$f(\theta)$:	0.3706	0.4068	0.4433

14 a Find the first two derivatives of $(x)^{1/3}$ at $x = 50$ and $x = 56$ given the table below:

x	50	51	52	53	54	55	56
$y = x^{1/3}$	3.6840	3.7804	3.7325	3.7563	3.7798	3.8030	3.8259

OR

b By dividing the range into ten equal parts, evaluate $\int_0^{\pi/2} \sin x dx$ by (a) Trapezoidal rule (b) Simpson's rule . Verify your answer with integration.

15 a Using Taylor's series method, find $y(1.1)$ and $y(1.2)$ correct to four decimal places given $\frac{dy}{dx} = xy^{1/3}$ and $y(1) = 1$.

OR

b Using Milne's method find $y(2)$, if $y(x)$ is the solution of $\frac{dy}{dx} = \frac{1}{2}(x + y)$ given $y(0) = 2, y(0.5) = 2.636, y(1) = 3.595$ and $y(1.5) = 4.968$.

Z-Z-Z END