Seat No.	

Set P

B.Sc. (Semester - VI) (Old) (CGPA) Examination Oct/Nov 2019
Mathematics (Special Paper – XII)
NUMERICAL ANALYSIS

Day & Date: Wednesday, 09-10-2019 Max. Marks: 70
Time: 08:00 AM To 10:30 AM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of scientific calculators are allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) If $f(x) = x^3 - 5x^2 + 10$, then $\Delta^3 f(x) =$ _____
a) 6 b) -6
c) 10 d) -10

2) The nth forward difference of $f(x)$ is given by _____
a) $\Delta^n f(x+h) - \Delta^{n-1} f(x)$ b) $\Delta^{n-1} f(x+h) - \Delta^{n-1} f(x)$
c) $\Delta^{n+1} f(x+h) - f(x)$ d) None of these

3) The value of $\Delta^n(e^x) =$ _____ the interval of differencing being 1.
a) $(e+1)^n e^x$ b) $(e-1)^n e^x$
c) e^x d) $n\, e^x$

4) $\left(E^{\frac{1}{2}} + E^{-\frac{1}{2}}\right)(1+\Delta)^{\frac{1}{2}} =$ _____
a) $\Delta + 1$ b) $\Delta - 1$
c) $\Delta + 2$ d) $\Delta - 2$

5) $\Delta \tan^{-1} x =$ _____
a) $\tan^{-1}\left\{\frac{h}{1+hx+x^2}\right\}$ b) $\tan^{-1}\left\{\frac{h}{1-hx+x^2}\right\}$
c) $\tan^{-1}\left\{\frac{h}{1+hx-x^2}\right\}$ d) None of these

6) If $\lambda_1, \lambda_1, \lambda_1$ are real and equal roots then C.F. = _____
a) $c_1(\lambda_1)^n + c_2(\lambda_1)^n + c_3(\lambda_1)^n$ b) $(c_1 + c_2 n + c_3 n^2)(\lambda_1)^n$
c) $(c_1 - c_2 n - c_3 n^2)({\lambda_1}^n)$ d) None of these

7) The order of equation $y_{n+2} - 2y_n + y_{n-1} = 1$ is _____
a) 3 b) 2
c) 1 d) -1

8) The particular integral of the equation $y_{n+2} - 4y_{n-1} + 3y_n = 5^n$ is _____
a) $\frac{5^n}{18}$ b) $\frac{8}{5^n}$
c) $\frac{5^n}{8}$ d) $\frac{-5^n}{8}$

9) Simpson's $(\frac{1}{3})^{rd}$ rule is obtained by putting $n =$ _____ in general quadrature formula.
a) 1 b) 2
c) 3 d) 0

10) The Lagrange's interpolation formula for unequal intervals for n points is a polynomial of degree _____.
a) $n+1$ b) n
c) $n-1$ d) $n-3$

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11) The number of strips required in Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule is multiple of _____.

a) 1 b) 2
c) 3 d) 4

12) The value of $\int_0^1 \frac{dx}{1+x} =$ _____

a) 0.69315 b) 0.69915
c) 0.96315 d) 0.69351

13) Interpolation is the technique of estimate the value of a function for any _____

a) Intermediate value of the constant
b) Intermediate value of the variable
c) Both a) and b)
d) None of these

14) If $f(0) = 1,\ f(2) = 5,\ f(3) = 10$ and $f(x) = 4$ then $x =$ _____

a) $\frac{5}{13}$ b) $\frac{-5}{13}$
c) $\frac{15}{13}$ d) $\frac{13}{5}$

Q.2 A) Attempt any four of the following questions. 08

1) Evaluate $\Delta^2(ab^x)$
2) With usual notation, prove that $hD = \log(1+\Delta) = -\log(1-\nabla)$
3) State Newton's backward interpolation formula.
4) Solve $y_{n+2} - 4y_n = 0$
5) Solve $y_{n+2} - 5y_{n+1} + 6y_n = 4^n$

B) Attempt any two of the following questions. 06

1) Find the by, $f(10)$ by using Lagrange's formula for

x	5	6	9	11
$f(x)$	12	13	14	16

2) Evaluate $\int_0^1 \frac{x^2}{1+x^3}\,dx$ by using Simpson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule.

3) Solve $y_{n+2} - 2y_{n+1} + y_n = n^2 2^n$

Q.3 A) Attempt any two of the following questions. 08

1) Prove that $1 + \delta^2\mu^2 = \left(1 + \frac{1}{2}\delta^2\right)^2$

2) The following data gives the velocity of a particle for 20 seconds at interval of 5 seconds. Find the initial acceleration using the entire data:

Time t (sec) :	0	5	10	15	20
Velocity v (m/sec) :	0	3	14	69	228

3) Solve $y_{x+1}^2 - 3y_{x+1}.y_x + 2y_x^2 = 0$

B) Attempt any one of the following question. 06

1) State the prove Newton's forward interpolation formula.
2) Given that :

x	1	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.451	9.451	9.750	10.031

Find $\frac{dy}{dx}$ at $x = 1.1$

Q.4 A) Attempt any two of the following questions. **10**

1) Solve :

i) $y_{n+2} - 2\cos\alpha . y_{n+1} + y_n = \cos\alpha\, n$

ii) $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$

2) State and prove Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule.

3) With usual notation, prove that

i) $\Delta = E\nabla = \nabla E$

ii) $E = e^{hD}$

B) Attempt any one of the following question. **04**

1) Solve $y_{x+1} - y_x + xy_{x+1}\, y_x = 0$ given $y_1 = 2$

2) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface

$x =$ height :	100	150	200	250	300	350	400
$y =$ distance :	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the value of y when $x = 410$ ft

Q.5 Attempt any two of the following questions. **14**

a) State the prove Trapezoidal rule hence evaluate $\int_0^6 \frac{dx}{1+x^2}$

b) State and prove Lagrange's interpolation formula for unequal intervals.

c) Evaluate:

i) $\Delta^2 \cos 2x$

ii) $\Delta^2 \left(\frac{5x+12}{x^2+5x+6}\right)$