(6 pages) **Reg. No. : .....**

Code No. : 41162 E **Sub. Code : JMMA 5 A**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

Fifth Semester

Mathematics — Main

Elective — I — NUMERICAL METHODS

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The positive root of the equation $x^4 - x^3 - 2x^2 - 6x - 4 = 0$ lies between ———— and ————.

   (a) 0, 1 (b) 1, 2

   (c) 2, 3 (d) None of these

2. The rate of convergence in Newton-Raphson method is ————.

   (a) 3 (b) 2

   (c) 1 (d) None of these

3. Which of the following is incorrect?

   (a) $\nabla = 1 - E^{-1}$ (b) $\delta = E^{-1/2}\Delta$

   (c) $\delta = E^{1/2}\nabla$ (d) $E = (1 - \nabla)$

4. The nth forward differences of a polynomial of nth degree are ————.

   (a) variable (b) constants

   (c) zeros (d) none of these

5. If $f(x) = \frac{1}{a}$, then $f(a, b) =$ ————.

   (a) $\frac{1}{ab}$ (b) ab

   (c) $-\frac{1}{ab}$ (d) $-ab$

6. The number of methods of inverse interpolation is ————.

   (a) 1 (b) 2

   (c) 3 (d) 4

7. $D^2 =$ _____.

(a) $\frac{1}{h^2}[\Delta^2 - \Delta^3 + \frac{11}{12}\Delta^4 - \ldots]$

(b) $\frac{1}{h^2}[\Delta - \Delta^2 + \frac{11}{12}\Delta^3 - \ldots]$

(c) $\frac{1}{h}[\Delta^2 - \Delta^3 + \frac{11}{12}\Delta^4 - \ldots]$

(d) None of these

8. The error in Simpson's $\frac{1}{3}$ rule is _____.

(a) h (b) h^2

(c) h^3 (d) h^4

9. The order and degree of the equation $\frac{[1+(y')^2]^{3/2}}{y''}$ is _____ and _____.

(a) 3, 2 (b) 2, 3

(c) 2, 2 (d) 3, 3

10. The complementary function of $(D^2 - 2D + 4)y = e^x \cos x$ is _____.

(a) $Ae^{-2x} + Be^{2x}$

(b) $Ae^{-2x} + e^x(B\cos x + C\sin x)$

(c) $Ae^{-2x} + (B\cos x + C\sin x)$

(d) None of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Explain the method of false position.

Or

(b) Find an iterative formula to find $\sqrt{N}$ (where N is a positive number) and hence find $\sqrt{5}$.

12. (a) Find the sixth term of the sequence 8, 12, 19, 29, 42.

Or

(b) Evaluate : $\Delta^n (e^{ax+b})$

13. (a) Prove that $\Delta^n f(x_0) = \frac{\Delta^n f(x_0)}{n!h^n}$.

Or

(b) Using Lagrange's interpolation formula, find the polynomial through (0, 0), (1, 1) and (2, 20).

14. (a) From following data, find $y'(6)$

x:	0	2	3	4	7	9
y:	4	26	58	112	466	922

Or

(b) Derive Weddle's rule.

15. (a) Solve : $\frac{dy}{dx} + y\cos x = \frac{1}{2}\sin 2x$.

Or

(b) Solve : $(D^2 + 5D + 6)y = e^x$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Find a positive root of $x^3 - 9x + 1 = 0$ lies in the interval (2, 4) by bisection method correct to 4 decimal places.

Or

(b) Solve the following system of equations using Gauss-seidel iterative method

$8x - 3y + 2z = 20$

$4x + 11y - z = 33$

$6x + 3y + 12z = 35$

17. (a) Express the equation $f(x) = x^3 - 3x^2 + 5x + 7$ interms of factorial polynomial taking $h = 2$ and find its differences.

Or

(b) Find y_6 if $y_0 = 9$, $y_1 = 18$, $y_2 = 20$, $y_3 = 24$ and that the third differences are constants.

18. (a) Using the following table, apply Gauss's forward formula to get $f(3.75)$.

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

Or

(b) Derive Bessel's interpolation formula.

19. (a) Find $f'(1.5)$, $f''(1.5)$ and $f'''(1.5)$ from the following data :

x :	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$:	3.375	7.000	13.625	24.000	38.875	59.000

Or

(b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by

(i) Trapezoidal rule

(ii) Simpson's rules.

20. (a) Solve : $(D^2 - 8D + 9)y = 8\sin 5x$.

Or

(b) Solve : $(D^2 + 1)y = x^2 e^{2x}$.

———————