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SARDAR PATEL UNIVERSITY

BSc Sem III Examination

Mathematics

US03CMTH21-Numerical Analysis

Date : 29-11-2019, Friday **Time : 2-00 TO 5-00 PM**

Q. 1 Answer the following by selecting correct choice from the options. **(10)**

1. The numerical difference between the true value of quantity and its approximate value is called _____.
   A. Absolute error
   B. Relative error
   C. Percentage error
   D. None
2. Newton-Raphson method is used for ____.
   A. Interpolation
   B. Approximation of derivative
   C. Approximation of root
   D. None
3. $f(a)$ and $f(b)$ are opposite in signs then the graph of $y = f(x)$ must intersect _____ in at least one point.
   A. Line $y = x$
   B. Line $y = -x$
   C. Y-axis
   D. X-axis
4. $\Delta y_1 - \Delta y_1 =$ ____
   A. $\Delta^2 y_0$
   B. $\Delta^2 y_1$
   C. $\Delta^2 y_{-1}$
   D. None
5. $\Delta =$ _____
   A. $1 + E$
   B. $E - 1$
   C. $1 + E^{-1}$
   D. $1 - E^{-1}$
6. $e^{hD} =$ _____
   A. Δ
   B. ∇
   C. E
   D. μ
7. Stirling's formula can be obtained by taking _____ of Gauss's forward and backward formulae.
   A. Mean
   B. Addition
   C. Subtraction
   D. None
8. The Lagrange's interpolation formula is applicable for _____ arguments.
   A. equal spaced
   B. unqual spaced
   C. equal and unqual both
   D. none
9. Substituting $n =$ ____in the General formula for integration, we get Simpson's $\frac{3}{8}$ rule.
   A. 5
   B. 2
   C. 3
   D. 4
10. The Euler's modified method is for finding _____.
    A. Numerical Differentiation
    B. Numerical Integration
    C. Solution of differential equation
    D. None

(P.T.O.)

Q. 2 Answer any TEN. **(20)**

1) Obtain the formula to obtain $\sqrt[3]{N}$ using Newton-Raphson method.
2) Find an interval containing an initial approximation of $sinx - cosx = 0$.
3) Explain Newton-Raphson method in short.
4) Show that $\mu^2 = 1 + \frac{1}{4}\delta^2$.
5) In usual notations Prove that $E^{-1} = 1 - \nabla$.
6) If $\nabla y_{10} = 10$ and $y_{10} = 25$ then find the value of y_9
7) Prove that $[x_2, x_1] = [x_1, x_2]$.
8) Given the set of tabulated points (x, y) which are $(1, -3), (3, 9), (4, 30) and\ (6, 132)$. Find y at $x = 2$ using Newton's Divided difference formula.
9) Tabulate $y = x^2$ for $x = 3,4,5,6$ and hence calculate $\sqrt[2]{12}$.
10) Discuss geometrical interpretation of Trapezoidal rule.
11) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ using Trapezoidal rule with $h = 0.25$.
12) Explain Picard's's method to solve first order ordinary differential equation.

Q. 3 (a) Explain Method of False Position to solve an equation $f(x) = 0$. **(5)**

(b) Find a real root of equation $2x = cosx + 3$ by iteration method correct up to three decimal places. **(5)**

OR

Q.3 (c) Explain Iteration method. **(5)**

(d) Find a real root of equation $x^3 - 4x - 9 = 0$ by method of False Position correct up to three decimal places. **(5)**

Q.4 (a) Derive Newton's Forward Difference interpolation formula. **(5)**

(b) Find the polynomial $f(x)$, which satisfy the following data and hence find the value of $f(1.5)$.

x	1	2	3	4	5
$f(x)$	4	13	34	73	136

OR

Q. 4 (c) Derive Gauss's Forward interpolation formula. **(5)**

(d) Use suitable interpolation formula, find $f(30)$ from the following table. **(5)**

x	21	25	29	33	37
$f(x)$	18.4708	17.8144	17.1070	16.3432	15.5154

Q. 5 (a) Derive Newton's divided difference formula. (5)

(b) Using Lagrange's interpolation formula find the form of function $y(x)$ from the following table. Hence find $y(2)$. (5)

x	0	1	3	4
y	-12	0	12	24

OR

Q. 5 (c) Obtain formulae for 1^{st} *and* 2^{nd} order differentiation of Gauss's Backward difference formula for tabular values of x. (5)

(d) Compute $f'(1.1)$ *and* $f''(1.1)$ from the following table. (5)

x	1.1	1.2	1.3	1.4	1.5
$f(x)$	2.0091	2.0333	2.0692	2.1143	2.1667

Q.6 (a) Derive the Simpson's $\left(\frac{3}{8}\right)^{th}$ rule (5)

(b) Evaluate $\int_0^{1.2} e^x\,dx$ by using Simpson's one third rule. (5)

OR

Q.6 (c) Derive Taylor's series Method to solve differential equation $\frac{dy}{dx} = f(x,y)$, with initial condition $y(x_0) = y_0$. (5)

(d) Use Euler's method to compute $y(0.2)$ if $\frac{dy}{dx} = x + y$ with $y(0) = 1$. (5)

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