BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(BT)-2024
Course Name – Numerical Methods
Course Code - BBS00023
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the number of significant figures in 0.03409.

a) 5 b) 6
c) 7 d) 4

(ii) If 0.1 is approximated to 0.09, then the relative error is __. Select the correct option.

a) $\frac{1}{9}$ b) 0.11111
c) 0.11 d) None of these

(iii) Select the correct option. The kind of error when 3.14 is approximate values of π is

a) inherent error b) truncation error
c) round-off error d) percentage error

(iv) Select the correct answer. If the number 0.0456 is rounded-off up to five significant figures then the obtained number is__.

a) 0.0456 b) 0.04560
c) 0.045600 d) None of these

(v) Select the correct answer if the number 3.45672 is rounded-off up to five significant figures then the number is

a) 3.456 b) 3.457
c) 3.458 d) 3.4567

(vi) Select the correct option. The round-off number of 0.859378 to four significant digits is

a) 0.8593 b) 0.9593
c) 0.8594 d) None of these

(vii) Identify the correct option. The accuracy attainable for the Newton-Raphson method__

a) does not depend upon the value of the derivative f(x). b) depends upon the value of derivative of f(x).
c) may depend upon the value of derivative of f(x). d) None of these.

(viii) Select the Newton-Raphson iterative formula for finding the square root of a real number R.

a) $x_{i+1} = \frac{x_i}{2}$ b) $x_{i+1} = \frac{3x_i}{2}$

c) $x_{i+1} = \frac{1}{2}\left(x_i + \frac{R}{x_i}\right)$ d) None of these.

(ix) Identify the rate of convergence of Bisection method.

a) linear b) quadratic
c) cubic d) none of these.

(x) Select the correct option.

In Gauss Jordan method to solve AX=B, A is transferred in a__.

a) singular matrix b) non-singular matrix
c) diagonal matrix d) orthogonal matrix

(xi) Choose the correct option. Lagrange's interpolation formula for two points of interpolation represents a

a) parabola b) circle
c) straight line d) none of these.

(xii) Choose the correct option.

In divided difference, the value of any difference is__ of the order of their arguments.

a) independent b) dependent
c) inverse d) none of these.

(xiii) Choose the correct option. The Milne's corrector formula of order 4 is__.

a) $y_{n+1} = y_{n-1} + \frac{h}{3}(f_{n-1} + 4f_n + f_{n+1})$ b) $y_{n+1} = y_{n-1} + \frac{4h}{3}(f_{n-1} - 4f_n + f_{n+1})$

c) $y_n = y_{n-1} + \frac{h}{3}(f_{n-1} - 4f_n + f_{n+1})$ d) None of these.

(xiv) Choose the correct option. The Picard's iteration formula is

a) $y_n(x) = y_0 + \int_{x_0}^{x} f(x, y_{n-1}(x))dx$ b) $y^{(n)}(x) = y_0 + \int_{x_0}^{x} f(x, y^n(x))dx$

c) $y^{(n+1)}(x) = y_0 + \int_{x_0}^{x} f(x, y^{n-1}(x))dx$ d) None of these

(xv) Choose the correct option. Using Runge kutta method of order two, with h=0.1, the value of y (0.1) for the IVP $y' = x + y$,y(0) =1 is___.

a) 1.11 b) 1.15034

c) 1.22034 d) 1.23034

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Round off the numbers 865250 to four significant figures and identify the relative error. (3)

3. Identify the relative error in the computation of $x - y$ for $x = 12.05$ and $y = 8.02$ having absolute errors $\Delta x = 0.005$ and $\Delta y = 0.001$. (3)

4. Identify the interval in which a positive root of $e^x - 3x = 0$ lies. (3)

5. Examine that $\Delta \cdot \nabla = \Delta - \nabla$. (3)

6. Evaluate $\int_0^1 \cos x \, dx$, correct upto three significant figures using the data: (3)

x	0	0.2	0.4	0.6	0.8	1.0
$\cos x$	1	0.9798	0.9199	0.8228	0.6924	0.5340

OR

Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule taking $n = 4$. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Identify the relative error and percentage error in approximating $\frac{4}{3}$ to 1.33. (5)

8. Describe (i) Relative errors
(ii) Percentage error (5)

9. Determine the root of the equation $x^3 - 10 = 0$ correct to two significant figures by using Newton Raphson method and taking the initial guess $x_0 = 2$. (5)

10. Calculate $\Delta^2(2x + 1)$, taking $h = 1$. (5)

11. Evaluate the value of $y(0.1)$ by Runge-Kutta method of order 2 of the differential equation: (5)
$\frac{dy}{dx} = x + y^2$, $y(0) = 1$ and $h = 0.1$.

12. Evaluate the value of $\int_0^5 \frac{dx}{1+x}$ by Trapezoidal rule taking $h = 1$, correct upto one decimal place. (5)

OR

Evaluate the value of $y(0.4)$ correct to two decimal places by Euler's method of the differential equation: (5)
$\frac{dy}{dx} = x - y$, $y(0) = 1$ taking $h = 0.2$.

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