

18024

B.C.A. Examination, Dec.-2024

Numerical Methods

(BCA-504)

Time : Three Hours] [Maximum Marks : 75

Note : Attempt questions from **all** sections as per instructions. Calculator is allowed.

Section-A

(Very Short Answer Type Questions)

Note : Attempt **all** the five questions of this section. Each question carries **3** marks. Very short answer is required.

$3 \times 5 = 15$

1. Obtain a real root of the equation $f(x) = x^3 + x^2 - 1 = 0$ using bisection method correct to three decimal places.
2. Define backward differences. Make backward difference table for the following ordered pairs :
 $(x_0, y_0), (x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4), (x_5, y_5), (x_6, y_6)$.

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3. Find the value of dy/dx at $x = 1.2$ for the following ordered pairs : $(1.0, 2.7183), (1.2, 3.3201), (1.4, 4.0552), (1.6, 4.9530), (1.8, 6.0496), (2.0, 7.3891), (2.2, 9.0250)$.

4. Solve the following system of linear equations using Gauss elimination method :

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$x + y + 3z = 5$$

5. Solve the equation $\frac{dy}{dx} = x + y^2; y = 1$ when $x = 0$ using Picard's method.

Section-B

(Short Answer Type Questions)

Note : This section contains three questions. Attempt any **two** questions. Each question carries $7\frac{1}{2}$ marks. Short Answer is required. $7\frac{1}{2} \times 2 = 15$

6. Find a real root of the equation :
 $2x = \log_{10} x + 7$ lying between 3 and 4 using method of false position. $7\frac{1}{2}$

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7. Find the missing terms in the following table :

x	0	5	10	15	20	25	30
y	1	3	-	73	225	-	1153

8. Evaluate

$$I = \int_3^{\pi} x^2 \log x \, dx$$

using Simpson's $\frac{1}{3}$ rule with $n = 1$

Section-C

(Detailed Answer Type Questions)

Note : This section contains five questions., attempt any **three** questions. Each question carries 15 marks. Answer is required in detail. $15 \times 3 = 45$

9. Use Newton-Raphson method to find a real root of the equation $\sin x = \frac{x}{2}$ correct to 3 decimal places, given that the root lies between $\pi/2$ and π . 15
10. Find the Lagrange Interpolating polynomial of degree 2 approximating the function $y = \log_e x$ defined by the following table of values. Hence determine the

value of $\log_e 2.7$.

15

x	2	2.5	3.0
$y = \log_e x$	0.69315	0.91629	1.09861

11. Use Simpson's $\frac{3}{8}$ -rule to evaluate

$$\int_0^1 \frac{1}{1+b} \, dx \text{ with}$$

$$h = \frac{1}{6} .$$

15

12. Solve the system of linear equations given below by Gauss's Siedel Iterative method

15

$$6x + y + z = 20$$

$$x + 4y - z = 6$$

$$x - y + 5z = 7$$

13. Using Fourth-order Ranger-Kutta method find $y(0.1)$ and $y(0.2)$ correct to four decimal places, given $\frac{dy}{dx} = y - x$ where $y(0) = 2$. 15

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