# B.E. III Semester Examination
## BE - III/12(A)
## 233194
## COM. ENGG.
## Course No. MTH - 312
## (Numerical methods using C - programming)

*Time Allowed- 3Hours*                    *Maximum Marks-100*

**Note:** Attempt **Five** questions, selecting atleast **two** from **each** section. Use of calculator is allowed.

## SECTION - I

1.  a)  Write a short note on Arrays by giving suitable example.

    b)  Describe how a "for loop" is used and explain how multiple initialization is done in C programming.

    c)  Write a program in C to print the sum of the series
        $1 + x + x^2 + x^3 + \dots + x^n$.                    (7,7,6)

2.  a)  Find a real root of the equation $x^3 - 2x - 5 = 0$ by Bisection method.

    b)  Geometrically explain Newton Raphson method to find out root of an equation.

    c)  Using Secant method determine the root of the equation $\cos x - xe^x = 0$ correct upto three decimal places.

                                                (7,7,6)

3.  a)  Find the iterative method based on the Newton-Raphson method for finding $\sqrt{N}$, Where N is a positive real number. Apply the method to N=18 to obtain the result correct upto two decimal places.

    b)  Find all roots of the polynomial $x^3 - 4x^2 + 5x - 2 = 0$ by using Graeffe's root squaring method.

    c)  Solve the equations $x_1 + x_2 + x_3 = 6,$ $3x_1 + 3x_2 + 4x_3 = 20$ and $2x_1 + x_2 + 3x_3 = 13$ by using Gauss elimination method.

                                                                    (7,7,6)

4.  a)  Find inverse of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by using Gauss Jordan method.

    b)  Determine the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 4 & 1 & 0 \\ 1 & 20 & 1 \\ 0 & 1 & 4 \end{bmatrix}$ correct upto 3 decimal places using power method.

    c)  For the matrix $\begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$ find all the eigenvalues and corresponding eigenvectors.

                                                                    (7,7,6)

## SECTION - II

5.  a)  Given

| x (in degrees) | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|
| sin x | 0.2588190 | 0.3420201 | 0.4226183 | 0.5 | 0.5735764 | 0.6427876 |

Find out the value of sin 38° by using Newton's backward difference formula.

b)  Find the missing term in the following table

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 1 | 3 | 9 | - | 81 |

c)  Derive Gauss forward formula.

(7,7,6)

6.  a)  The population in a town in decennial census was as under. Estimate the population for the year 1995.

| Year | 1921 | 1931 | 1941 | 1951 | 1961 |
|---|---|---|---|---|---|
| Population (in thousands) | 46 | 66 | 81 | 93 | 101 |

b)  Use Sterling's formula to find find $u_{32}$ from the following data.

$u_{20} = 14.035, u_{25} = 13.674, u_{30} = 13.257,$

$u_{35} = 12.734, u_{40} = 12.089, u_{45} = 11.309$

c)    Using Lagrange's formula, Compute f(2.5), given that

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| f(x) | 1 | 8 | 27 | 64 |

(7,7,6)

7.    a)    From the following table, obtain $\dfrac{dy}{dx}$ for x=1.2

| x | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.2 |
|---|-----|-----|-----|-----|-----|-----|-----|
| y | 2.7183 | 3.3201 | 4.0552 | 4.9530 | 6.0496 | 7.3891 | 9.0250 |

b)    Evaluate $\displaystyle\int_0^1 \dfrac{1}{1+x}dx$ correct to three decimal places by using trapezoidal rule.

c)    Given the following data, find the maximum value of y

| X | -1 | 1 | 2 | 3 |
|---|----|---|---|---|
| Y | -21 | 15 | 12 | 3 |

(7,7,6)

8.    a)    Given $\dfrac{dy}{dx} = x - y^2$ with $y(0) = 0$, calculate y(0.2) by picard's method upto 3rd approximation

b)    Using Euler's method Solve $\dfrac{dy}{dx} = 1 - y, y(0) = 0$ in the range $0 \le x \le 0.3$ by choosing h=0.1

c)    Solve $y'' - xy + 4y = 0$; $y(0)=3$; $y'(0) = 0$ at $x = 0.1$ by using Runge-kutta method.          (7,7,6)

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