Course: 16CA204 - Numerical Methods Event: ODD SEM BCA (DEC 2017)

DAYANANDA SAGAR UNIVERSITY

USN No:

III Semester B.C.A. Examinations – December 2017

Course Title: Numerical Methods | **Course Code:** 16CA204
Duration: 03 Hours | **Date:** 16-12-2017
Time: 10:00 AM to 01:00 PM | **Max Marks:** 60

Note: **1. Answer 5 full questions choosing one from each section**
2. Draw neat sketches wherever necessary
3. Missing Data may be suitably assumed

SECTION – 1

1.a. What is mathematical modeling? Write the advantages of mathematical modeling. (04 Marks)

1.b. Explain briefly about energy model for cattle growth. (05 Marks)

1.c. Explain the classification of models. (03 Marks)

OR

2.a. Use Gauss Siedel iteration method to solve the system of equations
$10x + y + z = 12$, $2x + 10y + z = 13$, $2x + 2y + 10z = 14$ (06 Marks)

2.b. Check whether the given matrix is ill conditioned or well conditioned.

$$\begin{bmatrix} 1 & 1/2 & 1/3 \\ 1 & 2/3 & 1/2 \\ 1 & 3/4 & 3/5 \end{bmatrix}$$ (06 Marks)

SECTION – 2

3.a. Use Gaussian Quadrature to estimate the integral $I = \int_2^5 (2x^2 - 3x)dx$ and verify the solution with the exact value. (05 Marks)

3.b. Evaluate the following integral using Romberg integration ($\epsilon_s = 0.5\%$)
$I = \int_0^8 (-0.055x^4 + 0.86x^3 - 4.2x^2 + 6.3x + 2)dx$ (07 Marks)

OR

4.a Solve the system of non-linear equation using successive substitution method with x = y = 1.5 (06 Marks)
$x^2 = 5 - y^2, \quad y + 1 = x^2$

4.b. Solve using Heun's method (06 Marks)
$\frac{dy}{dx} = y - x^2, y(0) = 1$
in 3 steps taking h = 0.2

SECTION – 3

5.a. Compute forward and backward difference approximation of $O(h)$ and $O(h^2)$ and central difference approximation of $O(h^2)$ and $O(h^4)$ for the first derivative of $y = cosx$ at $x = \frac{\pi}{4}$ using a value of $h = \frac{\pi}{2}$. (06 Marks)

5.b. Use Simpson's $\frac{1^{rd}}{3}$ rule and Simpson's $\frac{3^{th}}{8}$ rule to evaluate (06 Marks)
$\int_{-2}^{4}(1 - x - 4x^3 + 2x^5)dx$ taking n = 2

OR

6.a. Evaluate the integral $\int_0^{0.4} xe^{-x^2}$ using trapezoidal rule with step size 10 (05 Marks)

6.b. Find y(0.5) if y is the solution of initial value problem (05 Marks)
$\frac{dy}{dx} = -2x - y, y(0) = 1$
using Euler's method with step length 0.1

6.c. Write a note on prediction error of mathematical model. (02 Marks)

SECTION – 4

7.a. Solve $\frac{dy}{dx} = x^2 + y^2$ by fourth order Runge kutta method over the interval x = 1 to 2 using step size of 0.1 where y(1)=1.5 (06 Marks)

7.b. Solve the following system using LU decomposition method. (06 Marks)
x + y + z = 1 , 4x + 3y – z =6 , 3x + 5y +3z = 4

OR

8.a. Given
$\frac{dy}{dx} = -100000y + 99999e^{-t}$
If y(0)=0 use implicit Euler's to obtain a solution from t = 0 to 2 using step size 0.1 (06 Marks)

8.b. Given the data
0.90 , 1.42 , 1.30 , 1.55 , 1.63 , 1.32 , 1.35 , 1.47 , 1.95 , 1.66 ,1.96 1.47 , 1.92 , 1.35 , 1.05 , 1.85 , 1.74 , 1.65 , 1.78 , 1.71 , 2.29 , 1.82 2.06 , 2.14 , 1.27
Determine **(a)** the mean, **(e)** standard deviation, **(f)** variance, and **(g)** coefficient of variation. (06 Marks)

SECTION – 5

9.a. Use Guass elimination method to solve the system of linear equations
x – 2y – 6z = 12 , 2x + 4y + 12z = -17 , x – 4y – 12z = 22 (06 Marks)

9.b. Solve the boundary value problem using shooting method.
$\frac{d^2T}{dx^2} - 0.15T = 0$ with step size 2 and using T(0) =240 and T(10) = 150 (06 Marks)

OR

10.a. Solve the following system of equations with Gauss Siedel using overrelaxation (λ=1.25) and stopping a criterion of
$3x_1 + 8x_2 = 11,\ 6x_1 - x_2 = 5$ (use 3 iterations) (06 Marks)

10.b. Use Gauss Jacobi iteration method to solve the system of equations.
5x – y = 9 , x – 5y + z = - 4 , y – 5z = 6 (06 Marks)

Dayananda Sagar University

Date:

Time:

USN : ENG18CA00

SCHOOL OF ENGINEERING

KUDLU GATE, BANGALORE-560068

Department of Mathematics

3rd Semester BCA– IA Test 1

Numerical Methods

(16CA204)

Max Marks: 50		Duration: 1 ½ hrs
Note:	1. Answer any FIVE full Questions 2. Each question carries 10 marks	
1.	**Perform two iterations of Muller's method for** $cos(x) - xe^x = 0, , x_0 = -1, x_1 = 0, x_2 = 1$	10 Marks
2.	**Perform four iterations of Regula-Falsi Method** $ln\, x - x + 3 = 0$	10 marks
3.	**Perform four iterations of Newton Raphson Method** $x\, sin\, x + cos\, x = 0$	10 marks
4.	**Solve using Gauss Jordan method:** $x + y - z = 2$ $2x + 3y + 5z = -3$ $3x + 2y - 3z = 6$	10 marks
5.	**Solve by using LU decomposition method by considering** $u_{11} = u_{22} = u_{33} = 1$ $4x + y + z = 4$ $x + 4y - 2z = 4$ $3x + 2y - 4z = 6$	10 marks
6.	**Find the inverse of the matrix using Cholesky Method** $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$	10 marks

DAYANANDA SAGAR UNIVERSITY

USN No: ENG18CA0009

III Semester B.C.A. Examinations – December 2019 / January 2020

Course Title: Numerical Methods
Duration: 03 Hours
Time: 10:00 AM to 01:00 PM

Course Code: 16CA204
Date: 27-12-2019
Max Marks: 60

Note:
1. **Answer 5 full questions choosing one from each Section**
2. **Each Section carries 12 Marks**
3. **Draw neat sketches wherever necessary**
4. **Missing Data may be suitably assumed**

SECTION – 1

1.a. Find the 4th approximation to the solution of the equation $x^2 - 2x - 2 = 0$ using Bisection method. (06 Marks)

1.b. Perform 4 iterations of Newton Raphson method for $x^4 - x - 7 = 0$ correct to 4 significant digits by taking initial approximate root as $x_0 = 2$. (06 Marks)

OR

2.a. Determine the root of the equation $\cos x - xe^x = 0$ by the Regula – Falsi method. Perform four iterations. (06 Marks)

2.b. Perform one iteration of Muller's method for $x^3 - 13x - 12 = 0$ with $x_0 = 4.5, x_1 = 5.5, x_2 = 5$. (06 Marks)

SECTION – 2

3.a. Apply Gauss elimination method to solve the following system of equation: (06 Marks)

$$2x + 5y + 7z = 52$$
$$2x + y - z = 0$$
$$x + y + z = 9$$

3.b. Apply Gauss – Jordan method to solve the following system of equation: (06 Marks)

$$2x_1 + x_2 + 3x_3 = 1$$
$$4x_1 + 4x_2 + 7x_3 = 1$$
$$2x_1 + 5x_2 + 9x_3 = 3$$

OR

4. Find the inverse of the matrix using Cholesky method for $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 5 & 10 \\ 4 & 10 & 21 \end{bmatrix}$ (12 Marks)

SECTION – 3

5.a. Evaluate $\int_0^1 \sqrt{\sin x + \cos x}\, dx$ using Trapezoidal rule with $h = 0.1$. (04 Marks)

5.b. Find the value of $f'(0.35)$ using Richardson extrapolation with central divided difference scheme with $h = 0.25$ and $h = 0.125$ for $f(x) = 5xe^{-2x}$. (08 Marks)

OR

6.a. The following data were collected for the distance traversed versus time for a racket: (06 Marks)

t	0	25	50	75	100	125
x	0	32	58	78	92	100

Use numerical differentiation to estimate the velocity of the rocket at 0 sec, 100 sec, 125 sec.

6.b. Evaluate $\int_{0.2}^{3.8} xe^{-x}\, dx$ by using Simpson's $1/3^{rd}$ rule using for $n = 6$. (06 Marks)

SECTION – 4

7.a. Fit a straight line to the following data, also estimate the value of y at $x = 2.5$ (04 Marks)

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

7.b. Find the Fourier series expansion of (08 Marks)

$$f(x) = \begin{cases} \frac{\pi}{2} + x & if \quad -\pi \le x \le 0 \\ \frac{\pi}{2} - x & if \quad 0 < x \le \pi \end{cases}$$

defined on the interval $[-\pi, \pi]$.

OR

8.a. Find the Fourier series expansion of $f(x) = x^2$ on $[-L, L]$. (06 Marks)

8.b. Fit a second degree parabola using least square method for the following data: (06 Marks)

x	1996	1997	1998	1999	2000
y	40	50	62	58	60

SECTION – 5

9.a. Solve $y'' + 3y' + 2y = \sin 3t$ by the method of undetermined coefficients. (06 Marks)

9.b. Solve the initial value problem by Taylor's method $y' = \frac{x-y}{2}$ on $[0, 3]$ with $y(0) = 1$ correct to four decimal places by taking $h = 1$. Find $f(2)$. (06 Marks)

OR

10.a. Solve $y'' - 2y' - 3y = xe^{-x}$ by the method of variation of parameters. (06 Marks)

10.b. Use Runge – Kutta method of order 4 to find y(0.1) for $y' = \frac{5x^2 - y}{e^{x+y}}$ where $0 \le x \le 1, y(0) = 1$. (06 Marks)