Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 1st Semester Internal Assessment 2021

Full Marks: 10 **Time: 2 Hour**

Paper: MTM-104 Advanced Programming in C and MATLAB

Answer the following questions

1.1 What is the output of the following program? 1

```
main ( )
 {
 int m = 5;
 if (m < 3) printf("%d" , m+1) ;
 else if(m < 5) printf("%d", m+2);
 else if(m < 7) printf("%d", m+3);
 else printf("%d", m+4);
}
```

1.2 Distinguish between structure and union. 1

1.3 Write a ***for*** statement to print each of the following sequences of integers: 1, 3, 9, 27, 81, 243. 1

1.4 Given a number, write a program using while loop to reverse the digits of the number. For example, the number 12345 should be written as 54321. 2

2.1 What is the function 'linspace' in MATLAB? 1

2.2 How to find eigen values of a matrix in MATLAB? 1

2.3 How can you access first and last element together in an array by a single statement in MATLAB? 1

2.4 What are the functions of $nargin$ and $nargout$ functions? 1

2.5 What is the function $deconv$ in MATLAB? 1

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Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 1st Semester Internal Assessment 2022

Full Marks: 10 **Time: 1 Hour**

Paper: MTM-104 Advanced Programming in C

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*Answer **"any one"** of the following questions:*

1.1 What is the output of the following program? 1

```
int main ( )
 {
 int m = 5;
 if (m < 3) printf("%d" , m+1) ;
 else if(m < 5) printf("%d", m+2);
 else if(m < 7) printf("%d", m+3);
 else printf("%d", m+4);
}
```

1.2 Distinguish between structure and union. 1

1.3 Write a ***for*** statement to print each of the following sequences of integers: 1, 3, 9, 27, 81, 243. 2

1.4 Given a number, write a program using while loop to reverse the digits of the number. For example, the number 12345 should be written as 54321. 2

1.5 Write a function that will calculate and display the real roots of the quadratic equation $ax^2 + bx + c = 0$ using the quadratic formula $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$. Assume that a, b and c are floating-point arguments whose values are given, and that x_1 and x_2 are floating-point variables. Also, assume that $b^2 - 4ac > 0$ so that the calculated roots will always be real. 4

2.1 Which of the following is the correct syntax for initialisation of one-dimensional arrays? 1
(a) num[3]= {0 0 0 }; (b) num[3]= {0, 0, 0 }; (c) num[3]= {0; 0 ;0 }; (d) num[3]= 0

2.2 Write a program to read a matrix of size m × n and print its transpose. 4

2.3 Which of the following are the incorrect function declarations? 1
(a) int funct(int a, b;); (b) int funct(int a, int b); (c) int funct(int , int); (d) int funct(int ,);

2.4 Define a structure that can describe a hotel. It should have members that include the name, address, grade, average room charge, and number of rooms. Write functions to perform the following operations: 4

- To print out hotels of a given grade in order of charges.
- To print out hotels with room charges less than a given value

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Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 1st Semester

Internal Paper Set 2021

Paper: MTM-104 Advanced Programming in C

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1. Answer any "five" from the following questions 5×2=10

(a) Write a for statement to print each of the following sequences of integers: –10, –12, –14, –18, –26, – 42

(b) What do you mean by void pointer in C? Explain with example.

(c) What are the difference between structure and union?

(d) Write the general format for file opening and file closing commands.

(e) What is the output of the following program?

```
main ( )
{
chart string [ ] = "HELLO WORLD" ;
int m;
for (m = 0; string [m] != '\0'; m++ )
if ( (m%2) == 0)
printf("%c", string [m] );
}
```

(f) Distinguish between printf and fprintf?

(g) What is meant by dynamic memory allocation? Distinguish between malloc and calloc.

2. **(a)** How is a multidimensional array defined in terms of an array of pointers? What does each pointer represent? How elements can be accessed in this case? 2+1+2

(b) Given two one-dimensional arrays A and B which are sorted in ascending order. Write a program to merge them into a single sorted array C that contains every item from arrays A and B, in ascending order. 5

3. **(a)** What is structure? How is it different from an array? How does the members of the structure are accessed in a C-programming? 1+2+2

(b) Write a program in C to read the name, age and weight of n persons using structure and display all information through pointer using malloc() function. 5

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 1st Semester

Internal Paper Set 2021

Paper: MTM-104 Advanced Programming in C

4. **(a)** What will be the output of the following statement? 1

printf ("%d", strcmp ("push", "pull"));

(b) Use recursive function calls to evaluate $f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$ 3

(c) Determine the output of the following program. 3

```
main ( )
{
   int  *ptr , stu [ ] = { 45, 43, 34, 43, 7};
ptr = & stu [0];
printf ("\n %d and %d ", *(ptr+2), *ptr);
}
```

(d) Write a programme to interchange the value of two variables using pointers. 3

M.Sc 2nd Semester Continuous Internal Assessment Examination, 2021

Department of Mathematics,

Mugberia Gangadhar Mahavidyalaya

(Numerical Analysis)

Paper MTM – 202

FULL MARKS : 10

Time : 30 Minutes

Answer any two questions

1. Find a Cubic spline curve that passed through (0, 0.0), (1, 0.5), (2, 2.0), (3, 1.5) with natural and boundary condition y"0)=y"(3)=0. 5

2. Use Chebyshev polynomial find least square approximation of second degree for $f(x)=\sqrt{1-x^2}$ in [-1, 1]. 5

3. Describe a method to solve a system of tri-diagonal equations. Solve the following tri-diagonal system of equations: 5

$X_{1+}X_{2=3}$, $X_{1+2}X_{2+}X_{3=6}$, $_3X_{2+2}X_{3=12}$

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 2nd Semester Internal Assessment-2021

Paper: MTM 297 **Full Marks: 5** **Time: 1 Hour**

Lab. 2: (Language: C Programming with Numerical Methods)

*Answer any "**One**" question* ***1×5=5***

1) Write a program in C to sort the list of numbers {15, 47, 81, 12, 56, 78, 25, 34, 45, 98} using Bubble sort technique.

2) Write a program in C to check whether a given string is palindrome nature or not. Test it for the strings: "deleveled", "redder", "mathematics".

3) Write a program in C to rewrite the name with surname first followed by initials of first and middle name. Test it for the names: (i) Sunil Kumar Dey (ii) Manas Kumar Mondal (iii) Soma Rani Majhi (iv) Sathi Jana

4) Write a program in C to search the string "quality" in the given string (Pattern Matching) "Student completes work with quality in mind".

5) Write a program in C to sort the names in alphabetic order. Test it for the names: (i) Sunil Kumar Dey (ii) Manas Kumar Mondal (iii) Soma Rani Majhi (iv) Sathi Jana (v) Rathin Samanta.

6) Write a program in C to find the word "daily" and replace by the word "weekly" in a given string "Student always completes daily assignments in a timely manner".

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Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 2nd Semester

2nd Internal Assessment-2021

Paper: MTM 297 **Full Marks: 5** **Time: 1 Hour**

Lab. 2: (Language: C Programming with Numerical Methods)

*Answer any "**One**" question* ***1×5=5***

1) Write a program in C to find matrix inverse by partial pivoting. Find the inverse of the following matrix $A=\begin{bmatrix} 2 & 4 & 5 \\ 1 & -1 & 2 \\ 3 & 4 & 5 \end{bmatrix}$

2) Write a program in C to solve the equations by Gauss elimination method.

$$2x1 + x2 + x3 = 4, x1 - x2 + 2x3 = 2, 2x1 + 2x2 - x3 = 3.$$

3) Write a program in C to obtain a quadratic polynomial approximation to $f(x) = e^{-x}$ using Lagrange's interpolation method, taking three points x = 0, 1/2, 1.

4) The following table gives pressure of a steam plant at a given temperature. Using Newton's formula, write a program in C to compute the pressure for a temperature of 142°C.

Temperature °C :	140	150	160	170	180
Pressure, kgf/cm^2:	3.685	4.854	6.302	8.076	10.225.

5) Write a program in C to Evaluate the double integral $I = \int_0^1 \int_0^2 \frac{2xy}{\sqrt{(1+x^2)(1+y^2)}}\, dy\, dx$ using Simpson's 1/3 rule with step size $h = k = 0.25$.

6) Write a program in C to find the value of the integration of $\int_0^1 \frac{1}{1+x^2}\, dx$ by Monte Carlo method for different values of N.

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Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 2nd Semester

2nd Internal Assessment-2022

Paper: MTM 297 **Full Marks: 5** **Time: 1 Hour**

Lab. 2: (Language: C Programming with Numerical Methods)

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Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 2nd Semester

2nd Internal Assessment-2022

Paper: MTM 297 **Full Marks: 5** **Time: 1 Hour**

Lab. 2: (Language: C Programming with Numerical Methods)

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*Answer any "**One**" question* ***1×5=5***

1) Write a program in C to find matrix inverse by partial pivoting. Find the inverse of the following matrix $A=\begin{bmatrix} 2 & 4 & 5 \\ 1 & -1 & 2 \\ 3 & 4 & 5 \end{bmatrix}$

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M.Sc 2nd Semester examination, 2022

Department of Mathematics, Mugberia Gangadhar Mahavidyalaya

General Topology

Paper MTM – 206

FULL MARKS : 5

3. Answer any one question.

(a)(i)Define limit point compact.

(ii)Show that compactness implies limit point compactness but not conversely.

(iii)Discuss the connectedness of the following sets-

A, $\left\{x \sin\frac{1}{x} : x \in (0,1)\right\}$

B. $\{|x| : x \in (-1,1)\} \cap \{e^x : x \in R\}$

(b) (i) Show that image of a compact space under a continuous map is compact.

(ii)Define quotient topology with example.

(iii)Give an example of which (X_1, τ_1) is T_3 space and τ_1 is subset of τ_2 but (X_2, τ_2) is not T_3 space.

M.Sc. 2nd Semester 2023

1st Internal Assesment

Department of Mathematics, Mugberia Gangadhar Mahavidyalaya

(NUMERICAL ANALYSIS)

Paper: MTM-202

Full Marks : 10 :: Time : 1/2 Hour

Answer any one question **10x1=10**

1. a) Use Tchebyshev polynomials to find least squares approximation of second degree for $f(x) = (1-x^2)^{5/2}$ on the interval [-1,1].

   b) Let $S(x)=14T_4(x) +7T_3(x)+2T_2(x)-23T_0(x)$. Find the value of S(1).

   c) State the minimax principle of polynomial interpolation.

   d) Write down the sufficient conditions for the convergence of fixed point iteration method. [4+2+2+2]

2. a) Define spline interpolation.

   b) Derive the periodic spline interpolation of a continuous function y=f(x) in [a, b].

   c) Find the value of b when $\varphi(x) = \begin{cases} p0(x), 0 \le x \le 1 \\ p1(x), 1 \le x \le 2 \end{cases}$

   Where, $p_0(x)= 0.98x^3 - 0.68x^2+0.2x, \ 0 \le x \le 1$

   $$P_1(x) = -1.04(x-1)^3 + 2.26(x-1)^2 +1.78(x-1) +b, \ 1 \le x \le 2$$

   is a cubic spline. [2+5+3]

3. a) Explain the Baristow method to find all roots of a polynomial equation.

   b) Consider the initial value problem $\frac{dy}{dx} = x+y$, $y(0) = 1$.Then find the approximate value of the solution y(x) at x = 0.2, using improved Euler method, with h= 0.2. [7+3]

M.Sc. 2nd Semester 2023

1st Internal Assesment

Department of Mathematics, Mugberia Gangadhar Mahavidyalaya

(GENERAL THEORY OF CONTINUUM MECHANICS)

Paper: MTM-205

Full Marks : 10 :: Time : 1/2 Hour

Answer any one question **10x1=10**

1. a) State the uniqueness theorem.

b) State and prove Kelvin's minimum energy theorem.

c) Derive the relation between strain vector $\vec{E}^{(N)}$ and strain tensor E_{ij} .

d) Prove that $\vec{R}$ = **rot** $\vec{u}$. [2+4+2+2]

2. a) The displacement in an elastic solid is given by $u_1 = a(X_1 + 2X_2 + 3X_3)$, $u_2 = a(-2X_1 + X_2)$, $u_3 = a(X_1 + 4X_2 + 2X_3)$, where a is small quantity. Find dilatation, rotation vector, principal strain and corresponding principal axes.

b) Prove that volumetric strain or cubical dilatation is equal to the sum of three linear strains. [6+4]

3. a) Prove that pressure at a point in a perfect fluid has the same magnitude in every direction.

b) Derive the Lagrangian finite strain tensor ($\mathbf{r}_{ij}$) and change in the angle between two line elements. Hence show that the body has undergone only rigid body deformation if $\mathbf{r}_{ij} = \mathbf{0}$. [4+6]

M.Sc 2nd Semester Internal Examination, 2023

Department of Mathematics, Mugberia Gangadhar Mahavidyalaya)

(General Topology)

Paper MTM – 206

FULL MARKS : 5

Time :30 minutes

Answer any one question $\mathbf{1 \times 5 = 5}$

(a) Let X and Y be two topological space ,$f: X \to Y$be a mapping then following are equivalent

1.f is continuous

2. for every closed set B of Y the set $f^{-1}(B)$ is closed in X.

(b) Examine the compactness of the following sets over the interval $(0,1)$

1. $\left\{\left(sin^2(\frac{n\pi}{100}, cos^2\left(\frac{n\pi}{100}\right)\right) : n \in \mathbb{N}\right\}$
2. $\left\{\left(\frac{1}{2}e^{-\pi}, 1 - \frac{1}{(n+1)^2}\right) : n \in \mathbb{N}\right\}$

(c) Let two topologies τ_1 and τ_2 on a non empty set X and if β_1 and β_2 are two basis of τ_1 and τ_2 respectively. Then following are equivalent…..

(i)$\tau_1 \subset \tau_2$

(ii)For every $x \in B_1, B_1 \epsilon \beta_1 \exists$ elementB_2 of $\beta_2$such that $x \in B_2 \subset B_1$

M.Sc 2nd Semester Internal Examination, 2023

Department of Mathematics, Mugberia Gangadhar Mahavidyalaya)

(General Topology)

Paper MTM – 206

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2. $\left\{\left(\frac{1}{2}e^{-\pi}, 1 - \frac{1}{(n+1)^2}\right) : n \in \mathbb{N}\right\}$

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Mugberia Gangadhar Mahavidyalaya

Depertment of Mathematics(UG & PG)

M.Sc 2nd Semester Internal Assesment-2023

Paper-MTM201 **Full Marks-10** **Time-1/2 Hour**

Fluid Mechanics

Answer any "Two" questions 2x5=10

1. Determine the equation of the rate of work done on element due to body and free surface. 5
2. Derive temperature distribution of the fluid as a function of mean temperature and surface temperature. 5
3. (a)Describe one, two and three dimensional flow.

   (b) What is vortex line and complex potential.

   (c) What are the differences between laminar and turbulent flows?

   5

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 3rd Semester Internal Assessment 2022

Full Marks: 10 **Time: 1 Hour**

Paper: MTM-305B Special Paper-OR: Advanced Optimization and Operations Research

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*Answer any "**one**" the following questions*

1.1 Point out the scope of post-optimality analysis? **2**

1.2 Solve the following LPP using Modified Dual Simplex Method. **8**

$$\text{Max } z = 2x_1 - x_2 + x_3$$
$$\text{Subject to, } 2x_1 + 3x_2 - 5x_3 \geq 4$$
$$-x_1 + 9x_2 - x_3 \geq 3$$
$$4x_1 + 6x_2 + 3x_3 \leq 8$$
$$x_1, x_2, x_3 \geq 0$$

2.1 Comment the effect on the optimality of the solution, when the objective function of the LPP **3**

$$\begin{aligned} &Maximize && z = 3x_1 + 5x_2 \\ &Subject\ to && 3x_1 + 2x_2 \leq 18, \\ & && x_1 \leq 4, \\ & && x_2 \leq 6, \\ & && x_1, x_2 \geq 0. \end{aligned}$$

is changed to $z = 3x_1 + x_2$.

2.2 Find the optimal solution of the LPP: **7**

$$\begin{aligned} &Maximize && z = 4x_1 + 5x_2 \\ &Subject\ to && 3x_1 + 4x_2 \leq 14, \\ & && 4x_1 + 2x_2 \leq 8, \\ & && 2x_1 + x_2 \leq 6, \\ & && x_1, x_2 \geq 0. \end{aligned}$$

Show that the optimality of the solution is not violated if the right hand side of the first constraint varies between 6 and 16. Show further that the range of c_2 is $\left(\frac{5}{2}, \frac{20}{3}\right)$ in order that the optimal solution obtained remains optimal.

3.1 What do you mean by a unimodal function? Give an example. **2**

3.2 Minimize the function $f(x) = 0.65 - \left[\frac{0.75}{1+x^2}\right] - 0.65\, x \tan^{-1}\left(\frac{1}{x}\right)$ using the Golden section method with $n = 6$. **4**

3.3 Discuss the sensitivity of changes of the cost co-efficient in the objective function of a LPP associated with both basic and non-basic variables. **4**

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 3rd Semester Internal Assessment 2022

Full Marks: 10 **Time: 1 Hour**

Paper: MTM-305B Special Paper-OR: Advanced Optimization and Operations Research

Exam attendance link (must): https://forms.gle/reZMTdTcHDe3eNmu5

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Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 3rd Semester Internal Assessment 2021

Full Marks: 10 **Time: 2 Hour**

Paper: MTM-305B Special Paper-OR: Advanced Optimization and Operations Research

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*Answer any "**one**" the following questions*

1.1 Point out the scope of post-optimality analysis? **2**

1.2 Using algebraic approach show that the expression $ax + \frac{b}{x} + c; a, b > 0$ has minimum value $2\sqrt{ab} + c$ at $x = \sqrt{\frac{a}{b}}$. **2**

1.3 Comment the effect on the optimality of the solution, when the objective function of the LPP **2**

$$\begin{aligned} &Maximize && z = 3x_1 + 5x_2 \\ &Subject\ to && 3x_1 + 2x_2 \leq 18, \\ & && x_1 \leq 4, \\ & && x_2 \leq 6, \\ & && x_1, x_2 \geq 0. \end{aligned}$$

is changed to $z = 3x_1 + x_2$.

1.4 Find the optimal solution of the LPP: **4**

$$\begin{aligned} &Maximize && z = 4x_1 + 5x_2 \\ &Subject\ to && 3x_1 + 4x_2 \leq 14, \\ & && 4x_1 + 2x_2 \leq 8, \\ & && 2x_1 + x_2 \leq 6, \\ & && x_1, x_2 \geq 0. \end{aligned}$$

Show that the optimality of the solution is not violated if the right hand side of the first constraint varies between 6 and 16. Show further that the range of c_2 is $\left(\frac{5}{2}, \frac{20}{3}\right)$ in order that the optimal solution obtained remains optimal.

2.1 Solve the following LPP using Revised Simplex method. **5**

$$\begin{aligned} &\text{Max } z = 5x_1 - x_2 + 3x_3 \\ &\text{Subject to, } 2x_1 + 2x_2 - x_3 \geq 2 \\ &\qquad 3x_1 - 4x_2 \leq 3 \\ &\qquad x_2 + 3x_3 \leq 5 \\ &\qquad x_1, x_2 \geq 0 \end{aligned}$$

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 3rd Semester Internal Assessment 2021

Full Marks: 10 **Time: 2 Hour**

Paper: MTM-305B Special Paper-OR: Advanced Optimization and Operations Research

2.2 Solve the following problem using Gomory's cutting plane method: **5**

$$\begin{aligned} &Maximize && f = 6x_1 + 7x_2 \\ &Subject\ to && 7x_1 + 6x_2 \leq 42, \\ & && 5x_1 + 9x_2 \leq 45, \\ & && x_1 - x_2 \leq 4, \\ & && x_1, x_2 \geq 0 \text{ and integers.} \end{aligned}$$

3.1 Solve the following IPP using Branch and bound method. **5**

$$\begin{aligned} &Maximize && z = 3x_1 + 4x_2 \\ &Subject\ to && 7x_1 + 11x_2 \leq 88, \\ & && 3x_1 - x_2 \leq 12, \\ & && x_1, x_2 \geq 0 \\ & && x_1, x_2 \text{ integers.} \end{aligned}$$

3.2 Solve the following LPP using Modified Dual Simplex Method. **5**

Max $z = 2x_1 - x_2 + x_3$

Subject to, $2x_1 + 3x_2 - 5x_3 \geq 4$

$-x_1 + 9x_2 - x_3 \geq 3$

$4x_1 + 6x_2 + 3x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

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M.Sc. 3rd Semester examination, 2022

Department of Mathematics, Mugberia Gangadhar Mahavidyalaya

Internal examination

(Integral Equations)

Paper MTM – 302

FULL MARKS : 10 :: Time : 1hours

1. Answer any two questions.

(ii) Show that the Integral equation y(x)=f(x)+ $\frac{1}{\pi}\int_0^{2\pi} \sin(x+t)\, y(t)dt$ possesses no solution for f(x)=x,but that is possesses infinitely many solutions when f(x)=1.

(iii) Form an integral equation corresponding to the differential equation

$$\frac{d^2y}{dx^2} - \sin(x)\frac{dy}{dx} + e^x y = x.$$

(Vi) Consider the integral equation $y(x) = cos2x + \lambda \int_0^{\pi} \cos(x+t)\, y(t)dt$ then find the eigen values and discuss the solution.

M.Sc 3rd Semester 1st Internal Assessment, 2020
Department of Mathematics, Mugberia Gangadhar Mahavidyalaya
(Special Paper-OR: Advanced Optimization and Operations Research)

Paper MTM – 305B **FULL MARKS: 10** **Time: 1 Hours**

Group A

Answer any one from the following questions: **1x5=5**

1. Solve the following LPP using Revised Simplex Method.

Max $z = 10x_1+9x_2$
Subject to, $8x_1+15x_2 \geq 10$
$10x_1+6x_2 \leq 10$
$6x_1+24x_2 \leq 12$
$x_1, x_2 \geq 0$

2. Solve the following LPP using Revised Simplex method.

Max $z = 5x_1-x_2+3x_3$
Subject to, $2x_1+2x_2-x_3 \geq 2$
$3x_1-4x_2 \leq 3$
$x_2+3x_3 \leq 5$
$x_1, x_2 \geq 0$

Group B

Answer any one from the following questions: **1x5=5**

3. Solve the following LPP using Modified Dual Simplex Method.

Max $z = 2x_1 - x_2 + x_3$
Subject to, $2x_1 + 3x_2 - 5x_3 \geq 4$
$-x_1 + 9x_2 - x_3 \geq 3$
$4x_1+6x_2 +3x_3 \leq 8$
$x_1, x_2, x_3 \geq 0$

4. Solve the following LPP using Modified Dual Simplex Method.

Min $z = -x_1 + x_2$
Subject to, $x_1-4x_2 \geq 5$
$x_1-3x_2 \leq 1$
$2x_1-5x_2 \geq 1$
$x_1, x_2 \geq 0$

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 3rd Semester

Internal Paper Set 2021

Paper: MTM-305B Special Paper-OR: Advanced Optimization and Operations Research

1.	Answer any "five" from the following questions	5×2=10
1.1	Point out the scope of post-optimality analysis?	2
1.2	What is the difference between Fibonacci and golden section methods?	2
1.3	Why is a conjugate directions method preferred in solving a general nonlinear problem?	2
1.4	Using algebraic approach show that the expression $ax + \frac{b}{x} + c; a, b > 0$ has minimum value $2\sqrt{ab} + c$ at $x = \sqrt{\frac{a}{b}}$.	2
1.5	Is the decomposition method efficient for all LP problems? Justify your answer.	2
1.6	Comment the effect on the optimality of the solution, when the objective function of the LPP $$\begin{aligned} Maximize \quad & z = 3x_1 + 5x_2 \\ Subject\ to \quad & 3x_1 + 2x_2 \leq 18, \\ & x_1 \leq 4, \\ & x_2 \leq 6, \\ & x_1, x_2 \geq 0. \end{aligned}$$ is changed to $z = 3x_1 + x_2$.	2
1.7	What do you mean by a unimodal function? Give an example.	
2.1	Describe the Fibonacci method to optimize a unimodal function and implement a flowchart of this method.	4+2
2.2	Minimize the function $f(x) = 0.65 - \left[\frac{0.75}{1+x^2}\right] - 0.65\, x \tan^{-1}\left(\frac{1}{x}\right)$ using the Golden section method with $n = 6$.	4
3.1	Discuss the sensitivity of changes of the cost co-efficient in the objective function of a LPP associated with both basic and non-basic variables.	4

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 3rd Semester

Internal Paper Set 2021

Paper: MTM-305B Special Paper-OR: Advanced Optimization and Operations Research

3.2	Find the optimal solution of the LPP: $Maximize \quad z = 4x_1 + 5x_2$ $Subject\ to \quad 3x_1 + 4x_2 \leq 14,$ $4x_1 + 2x_2 \leq 8,$ $2x_1 + x_2 \leq 6,$ $x_1, x_2 \geq 0.$ Show that the optimality of the solution is not violated if the right hand side of the first constraint varies between 6 and 16. Show further that the range of c_2 is $\left(\frac{5}{2}, \frac{20}{3}\right)$ in order that the optimal solution obtained remains optimal.	6
4.1	Solve the following LPP using Revised Simplex method. Max z = $5x_1-x_2+3x_3$ Subject to, $2x_1+2x_2-x_3 \geq 2$ $3x_1-4x_2 \leq 3$ $x_2+3x_3 \leq 5$ $x_1, x_2 \geq 0$	8
4.2	"Revised simplex method is better than the original simplex method ", why?	2
5.1	What is the necessity of using Modified Dual Simplex Method?	2
5.2	Solve the following LPP using Modified Dual Simplex Method. Max z = $2x_1 - x_2 + x_3$ Subject to, $2x_1 + 3x_2 - 5x_3 \geq 4$ $-x_1 + 9x_2 - x_3 \geq 3$ $4x_1+6x_2+3x_3 \leq 8$ $x_1, x_2, x_3 \geq 0$	8
6.1	Write the steps of Davidon – Fletcher –Powell method to solve a non-linear optimization problem.	4
6.2	What do you mean by "***Rate of change of a function along a direction***"?	2
6.3	Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $X_1 = \binom{0}{0}$ by Steepest Descent method.	4
7.1	In Branch and bound method, when a node is called "***fathomed***"	2

Paper: MTM-305B Special Paper-OR: Advanced Optimization and Operations Research

7.2	Solve the following IPP using Branch and bound method. $Maximize \quad z = 3x_1 + 4x_2$ $Subject\ to \quad 7x_1 + 11x_2 \leq 88,$ $3x_1 - x_2 \leq 12,$ $x_1, x_2 \geq 0$ $x_1, x_2\ integers.$	8
8.1	Define the term "***Gomory's constraint***"	2
8.2	Solve the following problem using Gomory's cutting plane method: $Maximize \quad f = 6x_1 + 7x_2$ $7x_1 + 6x_2 \leq 42,$ $Subject\ to \quad 5x_1 + 9x_2 \leq 45,$ $x_1 - x_2 \leq 4,$ $x_1, x_2 \geq 0\ and\ integers.$	8

M.Sc 4th Semester Continuous Internal Assessment Examination, 2021

Department of Mathematics,

Mugberia Gangadhar Mahavidyalaya

(Stochastic Process and Regression)

Paper MTM – 403(Unit-II)

FULL MARKS : 10

Time : 30 Minutes

Answer any one question

1. (a) Define stochastic process with example. Classify it with respect to state space and time.

(b) Define Markov Chain with example. What do you mean by state and transition probability?

(c) What do you mean by transition matrix? State Gambler's ruin problem and write transition matrix for it

2. Find the probability generating function for birth and death process when rate of birth and death are respectively $n\lambda$and $n\mu$, where n is the population size at any time t. Assume that the initial population size is k.

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 4th Semester Internal Assessment-2022

Paper: MTM 402 **Full Marks: 10** **Time: 1 Hour**

UNIT-I: Fuzzy Mathematics with Applications

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*Answer any "**Two**" questions* ***2×5=10***

1. (a) Check whether the following fuzzy set is fuzzy number or not. **5**
$\tilde{A} = \{(x,\ \mu_{\tilde{A}}(x)) | x \in \mathbb{R}\}$ where,

$$\mu_{\tilde{A}}(x) = \begin{cases} \left(1 + \left(\frac{5-x}{2}\right)^2\right)^{-1}, & x \leq 5 \\ \left(1 + \left|\frac{2(x-5)}{3}\right|\right)^{-1}, & x \geq 5. \end{cases}$$

(b) If $\tilde{A}$ = "real number considerably larger than 10" where,

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x \leq 10 \\ (1 + (x-10)^{-2})^{-1}, & x > 10 \end{cases}$$

Find A_α (α-level set) when $\alpha = 0.50$.

2. (a) Using addition rule for fuzzy numbers, prove that **5**

$$(3, 4, 5) + (4, 6, 8) = (7, 10, 13)$$

(b) State Zadeh's Extension Principle.

3. (a) Show that for interval numbers distributive law does not hold in general. **5**

(b) Evaluate the following: $2(5, 6, 8, 12) + 3(-1, 3, 4) - 5(-3, 2) + 8$.

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG)

M.SC., 4th Semester 2nd Internal Assessment-2023

Paper: MTM 402 **Full Marks: 10** **Time: 1/2 Hour**

UNIT-I: Fuzzy Mathematics with Applications

*Answer any **"One"** question* ***5×1=5***

1. If $\tilde{A}\tilde{Y} = \tilde{B}$be a fuzzy equation, find the solution $\tilde{Y}$ such that the membership of $\tilde{A}$ and $\tilde{B}$ are as follows: **5**

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x \leq 3 \text{ and } x > 5 \\ x-3, & 3 < x \leq 4 \\ 5-x, & 4 < x \leq 5 \end{cases}$$

$$\mu_{\tilde{B}}(x) = \begin{cases} 0, & x \leq 12 \text{ and } x > 32 \\ (x-12)/8, & 12 < x \leq 20 \\ (32-x)/12, & 20 < x \leq 32. \end{cases}$$

2. Using Zimmermann's method convert the following fuzzy LPP to corresponding crisp LPP **5**

$$\begin{aligned} \widetilde{Max} \quad & Z = x_1 + 2x_2 \\ s.t. \quad & -x_1 + 5x_2 \lesssim 21 \\ & 4x_1 + 3x_2 \lesssim 31 \\ & 3x_1 + 2x_2 \lesssim 41 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Given that the aspiration level z_0 and tolerance levels p_i as $z_0 = 21.5, p_0 = 5, p_1 = 3, p_2 = 4,$ and $p_3 = 7$.

UNIT-II: Soft Computing

*Answer any **"One"** question* ***5×1=5***

1. (i) How constraint optimization problem is handled to solve it using Genetic Algorithm. **5**
   (ii) What are the differences between supervised and unsupervised learning?
2. What do you mean by Fuzzy Inference System? Describe Mamdani's fuzzy inference method in short. **5**

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG)

M.SC., 4th Semester 2nd Internal Assessment-2023

Paper: MTM 402 **Full Marks: 10** **Time: 1/2 Hour**

UNIT-I: Fuzzy Mathematics with Applications

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UNIT-II: Soft Computing

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Page 1 of 1

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 4th Semester Internal Assessment-2021

Paper: MTM 402 **Full Marks: 10** **Time: 1 Hour**

UNIT-II: Soft Computing

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*Answer any "**One**" question* ***1×10=10***

1. A) What are the basic parameters of involved in Genetic Algorithm (GA)? **3+3+4**
   B) Draw a flow chart of Genetic Algorithm.
   C) Select the parent chromosomes for crossover using Roulette wheel selection procedure for the following information. Objective function: Max $f(x) = 50x - x^2, 1 \leq x \leq 30$, Current population: 01011, 10011, 01110, 01010, 01101 Random numbers: 0.41, 0.97, 0.12, 0.36, 0.64

2. A) Find the relational matrix of the concept "a young tall man", where "Young man"= $\frac{0}{115} + \frac{0.5}{120} + \frac{1}{125} + \frac{0.5}{130} + \frac{0}{135}$ and "Tall man"= $\frac{0}{170} + \frac{0.5}{175} + \frac{1}{180} + \frac{1}{185} + \frac{1}{190}$, if possible with reason. **5+5**

   B) What do you mean by Fuzzy Inference System. Describe Mamdani's fuzzy inference method in short.

Exam attendance link (must): https://forms.gle/ssDjH2XT6EzL6RD98

Submit your ANSWER SCAN PDF Copy using either the Attendance link above or the following Email or WhatsApp number.

Email: manoranjande.math.rs@jadavpuruniversity.in
WhatsApp number: 9382292498

Mugberia Gangadhar Mahavidyalaya
Department of Mathematics (UG & PG)

M.SC., 4th Semester Internal Assessment-2022

Paper: MTM 402 **Full Marks: 10** **Time: 1 Hour**

UNIT-II: Soft Computing

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*Answer any "**One**" question* ***1×10=10***

1. A) What are the basic parameters of involved in Genetic Algorithm (GA)? **3+3+4**

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   B) What do you mean by Fuzzy Inference System. Describe Mamdani's fuzzy inference method in short.

**********THE END**********

Mugberia Gangadhar Mahavidyalaya
Department of Mathematics (UG & PG)
M.SC., 4th Semester Internal Assessment-2022

Paper: MTM 402 **Full Marks: 10** **Time: 1 Hour**

UNIT-II: Soft Computing

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   B) What do you mean by Fuzzy Inference System. Describe Mamdani's fuzzy inference method in short.

**********THE END**********

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG),

M.SC., 4th Semester 1st Internal Assessment-2023

Paper: MTM 402 **Full Marks: 10** **Time: 1/2 Hour**

UNIT-I: Fuzzy Mathematics with Applications

*Answer any **"One"** question* ***5×1=5***

1. Show that for interval numbers distributive law does not hold in general. **5**

2. Using addition rule for fuzzy numbers, prove that **5**
$$(3,4,5)+(4,6,8)=(7,10,13)$$

UNIT-II: Soft Computing

*Answer any **"One"** question* ***5×1=5***

1. Select the parent chromosomes for crossover using Roulette wheel selection procedure for the following information. Objective function: Max $f(x)=50x-x^2, 1\le x\le 30$, Current population: 01011, 10011, 01110, 01010, 01101 Random numbers: 0.41, 0.97, 0.12, 0.36, 0.64. **5**

2. Find the relational matrix of the concept "a young tall man", where "Young man"= $\frac{0}{115}+\frac{0.5}{120}+\frac{1}{125}+\frac{0.5}{130}+\frac{0}{135}$ and "Tall man"= $\frac{0}{170}+\frac{0.5}{175}+\frac{1}{180}+\frac{1}{185}+\frac{1}{190}$, if possible with reason. **5**

M.Sc. 4th Semester Internal Examination, 2023

Department of Mathematics, Mugberia Gangadhar Mahavidyalaya

(Non Linear Optimization)

Paper MTM – 404

FULL MARKS : 10 :: Time : $\frac{1}{2}$ hours

1.Answer any two questions: $2\times 2 = 4$

(i) Find the relationship between solution of MP, LPM, FJSP, KTSP.

(ii) Define posynomial function.

(iii) What is Bimatrix game with explain .

2. Answer any one questions: $1\times 6 = 6$

(i) Use the chance constrained programming technique to find an equivalent deterministic form of stochastic programming problem.

Minimize $f(x) = \sum_{j=1}^{n} c_j\, x_j$

$$P\left[\sum_{j=1}^{n} a_{ij}x_j \le b_i\right] \ge p_i \quad , \text{i=1,2,.....m; j=1,2,.....n ; } x_j \ge 0$$

Where a_{ij} is normally distributed random variable.

(ii) Find the expected payoffs of two players

Strategy	t_1	t_2
s_1	(4,−4)	(−1,−1)
s_2	(0,1)	(1,0)

Mugberia Gangadhar Mahavidyalaya

Department of Mathematics (UG & PG)

M.SC., 4th Semester 2nd Internal Assessment-2023

Paper: MTM 402 **Full Marks: 10** **Time: 1/2 Hour**

UNIT-I: Fuzzy Mathematics with Applications

*Answer any **"One"** question* ***5×1=5***

1. If $\tilde{A}\tilde{Y} = \tilde{B}$be a fuzzy equation, find the solution $\tilde{Y}$ such that the membership of $\tilde{A}$ and $\tilde{B}$ are as follows: **5**

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x \leq 3 \text{ and } x > 5 \\ x - 3, & 3 < x \leq 4 \\ 5 - x, & 4 < x \leq 5 \end{cases}$$

$$\mu_{\tilde{B}}(x) = \begin{cases} 0, & x \leq 12 \text{ and } x > 32 \\ (x - 12)/8, & 12 < x \leq 20 \\ (32 - x)/12, & 20 < x \leq 32. \end{cases}$$

2. Using Zimmermann's method convert the following fuzzy LPP to corresponding crisp LPP **5**

$$\begin{aligned} \widetilde{Max} \quad & Z = x_1 + 2x_2 \\ s.t. \quad & -x_1 + 5x_2 \lesssim 21 \\ & 4x_1 + 3x_2 \lesssim 31 \\ & 3x_1 + 2x_2 \lesssim 41 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Given that the aspiration level z_0 and tolerance levels p_i as $z_0 = 21.5, p_0 = 5, p_1 = 3, p_2 = 4,$ and $p_3 = 7.$

UNIT-II: Soft Computing

*Answer any **"One"** question* ***5×1=5***

1. (i) How constraint optimization problem is handled to solve it using Genetic Algorithm. **5**
   (ii) What are the differences between supervised and unsupervised learning?
2. What do you mean by Fuzzy Inference System? Describe Mamdani's fuzzy inference method in short. **5**

Mugberia Gangadhar Mahavidyalaya

Depertment of Mathematics(UG & PG)

M.Sc 4th Semester Internal Assesment-2022

Paper-MTM405B **Full Marks-5**

Time-15 minutes

Operational Research Modelling –II

Answer any "One" question 1x5=5

1. Consider a binary channel with input symbols A={0, 1}, output symbols B={0, 1} and the channel matrix $\begin{bmatrix} \frac{3}{4} & \frac{1}{4} \\ \frac{1}{9} & \frac{8}{9} \end{bmatrix}$. The input probabilities $p_{10} = \frac{4}{5}$, $p_{20} = \frac{1}{5}$ Find the conditional backward input probabilities and joint probabilities. State fundamental theorem of information theory. 5
2. Describe Bang Bang control with example. 5

Mugberia Gangadhar Mahavidyalaya

Depertment of Mathematics(UG & PG)

M.Sc 4th Semester Internal Assesment-2022

Paper-MTM405B **Full Marks-5**

Time-15 minutes

Operational Research Modelling –II

Answer any "One" question 1x5=5

1. Consider a binary channel with input symbols A={0, 1}, output symbols B={0, 1} and the channel matrix $\begin{bmatrix} \frac{3}{4} & \frac{1}{4} \\ \frac{1}{9} & \frac{8}{9} \end{bmatrix}$. The input probabilities $p_{10} = \frac{4}{5}$, $p_{20} = \frac{1}{5}$ Find the conditional backward input probabilities and joint probabilities. State fundamental theorem of information theory. 5
2. Describe Bang Bang control with example. 5

Mugberia Gangadhar Mahavidyalaya

Depertment of Mathematics(UG & PG)

M.Sc 4th Semester Internal Assesment-2023

Paper-MTM405B **Full Marks-5** **Time-30 minutes**

Operational Research Modelling -II

Answer any "One" question 1x5=5

1. How many identical components each of which is 90% reliable over a period of 50 hours are used to obtain a 99.99% parallel redundancy system over 50 hours. If we want to obtain the same system reliability over a period of 100 hours, how many component should be added? What is mean time between failure?

   5

2. (a) In a certain community 25% of all girls are blondes and 75% of all blondes have blue eyes. Also 50% of all girls in the community have blue eyes. If you know that a girl has blue eyes, how much additional information do you get by being informed that she is blonde?

   (b)What is channel matrix? State fundamental theorem of information theory. 3+2