BBH-003-001618

BBH-003-001618

Seat No. ________

B. Sc. (Sem. VI) (CBCS) Examination

July – 2021

BSMT - 603 (A) : Mathematics

(Optimization And Numerical Analysis - II)

(Old Course)

Faculty Code : 003

Subject Code : 001618

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instruction:

(1) All questions are compulsory.

(2) Figure to the right indicates full marks of the question.

1. Give answers of all following questions. **[20]**

1. Define Surplus variable.
2. Define Convex function.
3. To solve maximization problem using Two phase method, the coefficient for an artificial variable in objective function is __________________ .
4. The method used to solve an assignment problem is called_____________.
5. Full form of LCM is ______________.
6. If for a given solution, a slack variable is equal to zero then the solution is infeasible. (True/False)
7. If an optimal solution is degenerate, then are alternative optimal solutions. (True/False)
8. In the optimal solution, more than one empty cell have their opportunity cost as zero, it indicates the problem has alternate solution.(True/False)
9. A necessary and sufficient condition for the existence of a feasible solution to the transportation problem is total cost is greater than total supply.(True/False)
10. The dummy source or destination in a transportation problem is added to satisfy rim condition. (True/False)
11. Which interpolation formula is an outcome of average of Gauss-Forward Interpolation and Gauss-Backward interpolation formula?
12. Write Bessel's Formula.
13. Newton's divided difference interpolation is same as ___________________if domain data is at equidistance.
14. The n^{th} divided differences of a polynomial of n^{th} degree are _________

15. Write D in term of Δ.

16. Minimum number of subintervals required to apply Trapezoidal and Simpson's 3/8 rule is__________________.

17. General Quadrature formula known as___________.

18. What is Numerical Differentiation?

19. Write Taylor's series formula to solve ordinary differential equation.

20. Runge-Kutta's method of second order produces more accurate solution than Euler method. (True/False)

2 (A) Attempt any THREE **[06]**

1. Obtain dual of the following LPP.

Minimize $Z = x_1 - 3x_2 + 2x_3$

Subject to

$3x_1 - x_2 + 2x_3 \leq 7$

$-2x_1 + 4x_2 + 0x_3 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0$

2. Solve the following assignment problem

		MEN		
		A	B	C
Task	1	60	50	40
	2	40	45	55
	3	55	70	60

3. Write matrix form of LPP.

4. Define (i) Feasible solution (ii) Optimal solution of the transportation problem.

5. Describe NWCM method.

6. Give the mathematical formulation of an assignment problem.

(B) Attempt any THREE **[09]**

1. Solve the following LPP using graphical method

Minimize $Z = 20x_1 + 10x_2$

Subject to

$x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$

$x_1, x_2 \geq 0$

2. Explain primal-dual relationship for the linear programming problem.
3. Explain artificial variable with example.
4. Find $C_{ij}'s$ only for empty cells

					Available
	20(1)		10(1)		30
		20(3)	20(2)	10(1)	50
		20(2)			20
Requirement	20	40	30	10	

5. Solve the following assignment problem

		MEN			
		A	B	C	D
TASK	I	16	52	34	22
	II	26	56	8	52
	III	76	38	36	30
	IV	38	52	48	20

6. Find the initial basic feasible solution for given problem by using VAM

		To				Supply
		D_1	D_2	D_3	D_4	
From	S_1	19	30	50	10	7
	S_2	70	30	40	60	9
	S_3	40	8	70	20	18
Demand		5	8	7	14	34

(C) Attempt any TWO **[10]**

1. Explain simplex algorithm.
2. Write algorithm of Hungarian method for an assignment problem.
3. Solve LPP using Big M method

Minimize $Z = x_1 + x_2$

Subject to

$2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

$x_1, x_2 \geq 0$

4. Obtain optimal solution of the following transportation problem using MODI method.

		To				Supply
		D_1	D_2	D_3	D_4	
From	S_1	6	4	1	5	14
	S_2	8	9	2	7	16
	S_3	4	3	6	2	5
Demand		6	10	15	4	35

5. Explain MODI method.

3 (A) Attempt any THREE **[06]**

1. If $f(x) = \frac{1}{x}$, then find $f(a, b, c, d)$.

2. Prove that divided differences are symmetric in all their argument.

3. If $f(0) = 1, f(2) = 5, f(3) = 10$ and $f(x) = 14$, find x.

4. Evaluate $\int_0^1 f(x)dx$, using Trapezoidal Rule, $f(x)$ is given by

x	0	0.5	1
$f(x)$	1	0.8	0.5

5. Explain Taylor series method to solve $\frac{dy}{dx} = f(x, y); y(x_0) = y_0$.

6. Write working rule Range - Kutta's method of fourth order.

(B) Attempt any THREE **[09]**

1. Evaluate $\int_2^6 \frac{dx}{x}$, Using Simpson's $\frac{1}{3}^{rd}$ Rule.

2. If $f(x) = x^3 - 2x$, then find $f(2,4,9,10)$.

3. Explain Picard's method to solve $\frac{dy}{dx} = f(x, y); y(x_0) = y_0$.

4. Derive General Quadrature formula.

5. Using Lagrange's interpolation formula, find $f(x)$

x	0	2	3	6
y	648	704	729	792

6. Explain Euler's method.

(C) Attempt any TWO **[10]**

1. Derive Gauss Backward Interpolation formula.
2. Derive Newton Divided Difference formula. Also deduce Gregory Newton forward difference formula.
3. Obtain the value of $f'(0.5)$ using sterling's formula to the following data:

x	0.35	0.40	0.45	0.50	0.55	0.60	0.65
$f(x)$	1.521	1.506	1.488	1.467	1.444	1.418	1.389

4. Solve $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$ in the range $0 \leq x \leq 0.2$ using (1) Improved Euler's Method (2) Modified Euler's Method.
5. Solve $\frac{dy}{dx} = y - x^2$ by Milne's method and compute y at $x = 0.80$ when:

x	0	0.2	0.4	0.6
y	1	1.12186	1.46820	1.73790