BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – B.Tech. in Computer Science & Engineering

Course Name - Numerical Analysis and Operational Research

Course Code - M101

(Semester – 1)

Time allotted: 3 Hours **Full Marks: 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Questions) 10 x 1 = 10

1. ***Choose the correct alternative from the following***

(i) If the total supply is less than the total demand, a dummy source (row) is included in the cost matrix with_____ .

a. dummy demand b. demand supply

c. zero cost d. none of the above

(ii) For solving an Assignment problem, which method is used?

a. Hungarian b. American

c. German d. None of the above

(iii) In the Gauss Elimination method for solving a system of linear algebraic equations, triangularization leads to _____ .

a. diagonal matrix b. lower triangular matrix

c. upper triangular matrix d. singular matrix

(iv) The Newton-Raphson method for finding roots of nonlinear equations falls under the category of _____ methods.

a. root bracketing
b. open
c. random
d. graphical

(v) The process of finding the values inside the interval (X_0, X_n) is called _____ .

a. interpolation
b. extrapolation
c. iterative
d. polynomial equation

(vi) Which of the following is an iterative method?

a. LU Matrix method
b. Matrix inversion method
c. Gauss Elimination method
d. Gauss Seidel method

(vii) The root of the equation lies between x_1 and x_0 if _____.

a. $f(x_0)*f(x_1)<0$
b. $f(x_0)*f(x_1)\leq 0$
c. $f(x_0)*f(x_1)>0$
d. $f(x_0)*f(x_1)\geq 0$

(viii) Dual of the dual is _____ .

a. primal
b. dual
c. alternative
d. none

(ix) A feasible solution is called a basic feasible solution if the number of non- negative allocations is equal to _____ .

a. m-n+1
b. m+n-1
c. m+n+1
d. none of these

(x) Operations Research attempts to find the best and _____ solution to a problem .

a. optimum
b. degenerate
c. perfect
d. none

Group – B

(Short Answer Type Questions) 3 x 5 = 15

Answer any *three* from the following.

2. Compute f(1.42) using Newton's Backward Interpolation formula from the table given below.

x:	1.1	1.2	1.3	1.4
f(x):	7.831	8.728	9.697	10.744

5

3. Compute $\int_0^1 x^2(1-x)dx$ using Simpson's One-third Rule correct upto 3 places of decimal taking step length as 0.1. 5

4. Formulate a linear programming model to determine how many deluxe and regular jackets the company should produce in order to maximize profit.

School Jacket	Cutting (hr.)	Sewing (hr.)	Decoration(hr)	Profit(Rs.)
Deluxe	0.16	0.47	0.40	18
Regular	0.15	0.28	0.14	12
Resource Availability	40.00	80.00	55.00	

5

5. Find dual of the given LPP:
Max: 6x + 5y + 10z
subject to:
$4x + 5y + z \leq 5$
$3x + 7z \leq 10$
$2x + y + 8z = 20$
$2y + 9z \geq 5$
x, y, z > 0, and y is unrestricted in sign. 5

6. A traveling salesman has to visit 5 cities. He wishes to start from a particular city, visit each city once and then return to his starting point. Cost of going from one city to another is given. Find the least cost route.

	A	B	C	D	E
A	-	4	7	3	4
B	4	-	6	3	4
C	7	6	-	7	5
D	3	3	7	-	7
E	4	4	5	7	-

5

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following:

7. (a) Solve the following system of linear equation using LU Matrix Factorization method:
$2x - 3y + 4z = 8$
$x + y + 4z = 15$
$3x + 4y - z = 8$ 7

(b) Solve the given system of linear equations using Gauss Jacobi Iterative method correct up to 2 places of decimal:
$20x - y - z = 23.28$
$x + 15y - z = 29.92$
$2x + y - 20z = -55.64$ 8

8. (a) Find a root of equation $f(x) = x^3 - 2x - 5$ using Newton Raphson method, correct up to 6 decimal places. 7

(b) Find the root of equation $f(x) = x^2 - x - 3$ using False position method in the interval [1, 3]. Show your work for 4 iterations. 8

9. (a) Calculate the value of $\int_0^1 x/(1+x)\,dx$ using Simpson's One -Third Rule correct upto 3 significant figures, taking six intervals. 7

(b) Find the value of $\int_0^6 1/(1+x^2)$ using Simpson's 3/8th rule where n = 6. Compute the corresponding absolute error. 7+1

10. (a) Consider a Transportation Problem with three warehouses and four markets. The warehouse capacities a_i market demand b_j and unit cost of shipping c_{ij} are given below. Find initial basic feasible solution using North West Corner method.

	M1	M2	M3	M4	Ai
W1	2	2	2	1	3
W2	10	8	5	4	7
W3	7	6	6	8	5
Bj	4	3	4	4	15

7

(b) The head of department has 5 jobs A, B, C, D, E and five subordinates V, W, X, Y, Z. The number of hours each man would take to perform each job is as follows:

	V	W	X	Y	Z
A	3	5	10	15	18
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

How would the jobs be allocated to minimize the total time?

8

11. (a) Consider the following LPP:
Maximize : $4x + 10y$
subject to :
$2x + y \leq 50$
$2x + 3y \leq 100$
$2x + 3y \leq 90$
$x \geq 0, y \geq 0$
Express the given LPP in standard form and use Simplex method to solve it. 8

(b) Make a graphical representation of the set of constraints in the following LPP:
Maximize: $z = 10x_1 + 15x_2$
Subject to:
$x_1 + x_2 \geq 2$
$3x_1 + 2x_2 \geq 6$
$x_1 \geq 0, x_2 \geq 0$
Find the corner points of the feasible region. Also, find the maximum value of the objective function. 7
