B. C. A. (Part-I) (Semester-II) NEP-2020
Examination, 2025
Mathematics Foundations to Computer Science-II
Subject Code: 109898

Day and Date : Monday, 09-06-2025

Time : 10.30 a.m. to 1.30 p.m.

Total Marks : 80

Instructions:
1) Que. 1 and Que. 8 are compulsory
2) Attempt any FOUR questions from Que. No. 2 to Que. No. 7.
3) Figures to the right indicate full marks.
4) Use of Scientific calculator is allowed.

Q.1 A. Select the correct alternatives for each of the following: [10]

i) Newton-Raphson method is also called --------
   a) Method of tangent
   b) Method of chord
   c) Interval halving method
   d) False position method

ii) In LPP when does feasibility change ....
   a) addition of variable
   b) change in objective functions coefficient
   c) change in right hand side of feasible region
   d) feasibility does not change

iii) The negation of the statement $5 \times 3 = 15$ or $7 + 5 = 12$ is --------------
   a) $5 \times 3 = 15$ or $7 + 5 = 12$
   b) $5 \times 3 \neq 15$ and $7 + 5 \neq 12$
   c) $5 \times 3 = 15$ or $7 + 5 \neq 12$
   d) $5 \times 3 \neq 15$ or $7 + 5 \neq 12$

iv) If G is a group and $a \in G$, then the subset $\{x \in G \mid xa = ax\}$ is called ...
   a) Normalizer of $a \in G$
   b) Centre of G
   c) digit coset of $a \in G$
   d) none of these

v) The value of $\Delta y_0 = $ --------
   a) $y_0 - y_1$
   b) $y_1 - y_0$
   c) $y_2 - y_1$
   d) $y_1 - y_2$

vi) How many occupied cells must be a transportation matrix with 8 rows and 7 columns have so that it does not degenerate ....
   a) 15
   b) 55
   c) 56
   d) 14

vii) Which of the following is not a proposition?

    a) Is mathematical boring?
    c) Diamond is harder than graphite

    b) Man landed on the sun last year
    d) He finished his work and went away

viii) In a group $G = \{\pm 1, \pm i\}$ the inverse of element i is ...

    a) 1
    b) i
    c) $-i$
    d) -1

ix) What is the negation of the statement "There exists a city where it rains every day"?

    a) "There exists no city where it rains every day"

    b) "There does not exist any city where it rains every day"

    c) "It rains every day in all cities"

    d) "It does not rain every day in all cities"

x) Which of the following is not a group?

    a) $(Z, -)$
    b) $(R, +)$
    c) $(N, .)$
    d) $(N, +)$

B. Attempt any two of the following: [10]

i) Find an initial basic feasible solution to the following Transportation Problem using the stepping stone method.

Destination

	D1	D2	D3	D4	Supply
O1	6	4	1	5	14
O2	8	9	2	7	16
O3	4	3	6	2	5
Demand	6	10	15	4	35

Origin (label for the rows O1, O2, O3)

ii) Determine whether the statement $\sim(p \wedge q) \vee r$ is a tautology, contradiction, or contingency.

iii) Use the graphical method to solve the following LP problem Maximize $z = = 5x + 3y$, subject to the constraints $3x + 5y \leq 15$, $5x + 2y \leq 10$, $x, y \geq 0$.

Q. 2. Using Newton's backward interpolation formula, find y at $x = 6$ from following table   [10]

x:	1	3	5	7
y:	24	120	336	720

Q. 3. Translate into symbolic form and test the validity of the following argument; If 6 is even,   [10]

then 2 does not divide 7. Either 5 is not prime or 2 divides 7. But 5 is prime. Therefore, 6 is not even.

Q. 4. Find by Newton's method, a root of the equation $x^3 - 5x + 3 = 0$ correct to 3 decimal places.   [10]

Q. 5. Show that   a) $(p \to q) \vee (\sim p \wedge \sim q)$ is a tautology.   [10]

                b) $\sim(p \vee q) \wedge (p \vee q)$ is a contradiction.

Q. 6. Define cyclic group. Show that the group $G = \{1, -1, i, -i\}$ under multiplication operation is a cyclic group.   [10]

Q. 7. Determine the initial basic feasible solution of the following transportation problem by Vogel's [10] approximation method.

Destinations

	D1	D2	D3	D4	Supply
O1	1	2	1	4	30
O2	3	3	2	1	50
O3	4	2	5	9	20
Demand	20	40	30	10	

Origins

Q. 8. Attempt any **four** of the following: [20]

i) Let $G = \{\pm 1, \pm i, \pm j, \pm k\}$ be group of quaternions. Find normalizer of each element of G.

ii) Verify the equivalence using truth table: $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$.

iii) Evaluate $\int_0^1 \frac{1}{1+x}\, dx$ using trapezoidal rule by taking h=0.2.

iv) Obtain an initial basic feasible solution to the following Transportation Problem using the matrix minima method.

Factories

	D1	D2	D3	D4	Supply
O1	6	3	5	4	22
O2	5	9	2	7	15
O3	5	7	8	6	8
Demand	7	12	17	9	

Warehouse

v) Show that the set $N = \{0, 1, 2, 3, \cdots\}$ is not group with respect to the operation of addition of integers.

vi) Convert the following L. P. P. in standard form

Maximize z = 3x + 2y subject to, $x - y \geq 1$, $x + y \geq 3$, x, y ≥ 0.

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[3]