

Satyug Darshan Institute of Engineering & Technology, Faridabad

Department of Applied Science and Humanities

Academic year 2025-26

Programme: BCA (DS/GEN)	Year & Semester: 2 nd
Course Name: Mathematics Foundation to computer Science-II	Course Code: BCG-102-V1
Prepared by: Dr. Priyavada	

Unit I

Short answer questions

Q.N.	Question	KL
1	What are logical connectives? Name any two	KL1
2	What is mathematical induction?	KL1
3	Define Conjunctive Normal Form (CNF).	KL1
4	Define Disjunctive Normal Form (DNF)	KL1
5	Write the two steps involved in mathematical induction.	KL1

Long answer questions

Q.N.	Question	KL
1	Using mathematical induction, prove that: $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$ for all natural numbers n .	KL4
2	Construct the truth table for the compound statement: $(p \vee q) \wedge \neg p$	KL4
3	Using truth table, show that the statement $p \vee \neg p$ is a tautology.	KL2
4	Convert the following into CNF and DNF: $(p \rightarrow q) \wedge r$	KL3
5	Using hypothetical syllogism, prove: Given $p \rightarrow q, q \rightarrow r$ Show that $p \rightarrow r$	KL2

Unit II

Short answer questions

Q.N.	Question	KL
1	Define a semigroup with example	KL1
2	Verify whether the group $\mathbb{Z}_6 = \{0,1,2,3,4,5\}$ under addition modulo 6 is cyclic	KL4
3	Verify whether the set of whole numbers $W = \{0,1,2, \dots\}$ under addition forms a monoid.	KL4
4	Verify whether the set $S = \{1,2,3\}$ under the operation $a * b = (a + b) \bmod 3$ forms a semigroup.	KL4
5	Difference between semigroup, monoid and group	KL4

Long answer questions

Q.N.	Question	KL
1	Verify that the set of integers $\mathbb{Z}$ under addition forms a group	KL4
2	Prove that the inverse of an element in a group is unique	KL3
3	a) Write any two properties of a group. b) Show that the set of integers under addition forms a group.	KL2
4	Prove that the set of natural numbers under addition forms a monoid but not a group.	KL3
5	Show that the set of integers under addition forms an abelian group.	KL2

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Unit III

Short answer questions

Q.N.	Question	KL
1	Explain Newton-Raphson method and Bisection Method.	KL2
2	What is percentage error? Give formula	KL1
3	Define numerical errors and accuracy of numbers	KL1
4	What information is required before applying Newton–Raphson method?	KL1
5	Write the formula of Newton’s divided difference formula and sterling formula.	KL1

Long answer questions

Q.N.	Question	KL												
1	Find the real root of the equation $x^4 - x = 10$ correct to four decimal places, using Newton-Raphson method in four steps	KL1												
2	Using Bisection method, find the root of the equation $x^3 - 4x + 9 = 0$.	KL1												
3	Solve by Simpson's 3/8 Rule $\int_0^2 \frac{dx}{16+x^2}$ with 6 sub intervals.	KL3												
4	Solve by Trapezoidal Rule $\int_0^2 \frac{dx}{16+x^2}$ with 6 sub intervals	KL3												
5	The population of a town in the decimal census was given below estimate the population for the year 1925 by using Newton backward interpolation formula.	KL3												
	<table><tr><td>Year (X)</td><td>1891</td><td>1901</td><td>1911</td><td>1921</td><td>1931</td></tr><tr><td>Pop (Y)</td><td>46</td><td>66</td><td>81</td><td>93</td><td>101</td></tr></table>		Year (X)	1891	1901	1911	1921	1931	Pop (Y)	46	66	81	93	101
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Unit IV

Short answer questions

Q.N.	Question	KL
1	Define Transportation problem of Linear programming problems.	KL1
2	Write four basic assumptions of Linear programming problems.	KL2
3	Explain Objective function of Linear programming problems.	KL2
4	Define Duality in Linear programming problems	KL1
5	Solve the following system of equations by the graphical method and find the solution: $x + y = 6$, $x - y = 2$	KL3

Long answer questions

Q.N.	Question	KL
1	Solve the following LPP using Dual Simplex method Minimize $Z = 2x_1 + x_2$ Subject to: $3x_1 + x_2 \geq 3$ $4x_1 + 3x_2 \geq 6$ $x_1 + 2x_2 \geq 3$ and $x_1 \geq 0$, $x_2 \geq 0$	KL3

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2	Obtained the initial basic feasible solution of a transformation problem whose cost and rim requirement table is given below. Solve by NWC method.	KL3																														
	<table><tr><td>Origin/Destination</td><td>D₁</td><td>D₂</td><td>D₃</td><td>Supply</td></tr><tr><td>O₁</td><td>2</td><td>7</td><td>4</td><td>5</td></tr><tr><td>O₂</td><td>3</td><td>3</td><td>1</td><td>8</td></tr><tr><td>O₃</td><td>5</td><td>4</td><td>7</td><td>7</td></tr><tr><td>O₄</td><td>1</td><td>6</td><td>2</td><td>14</td></tr></table>	Origin/Destination	D ₁	D ₂	D ₃	Supply	O ₁	2	7	4	5	O ₂	3	3	1	8	O ₃	5	4	7	7	O ₄	1	6	2	14						
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3	Find initial feasible solution for the Transportation problem by Vogel's Approximation Method.	KL1																														
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4	Write the solution steps of NWC method	KL2																														
5	Write the steps of Mathematical formulation of LPP.	KL2																														