Faculty of Computing and Technology

Department of Computing

Bachelor of Science (Hons) in Computer Science | Software Engineering | Information Technology

End - Semester Examination

Year 2023, Semester 01 -Batch 01

CS1103, SE1103, IT1103 – Fundamentals of Mathematics

Duration: 2 Hours

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nstructions to the candidates:

1. Answer all the questions.
2. Clearly write all the calculations where they needed.
3. The total number of marks will be 100.

uestion 01

a.) Solve the equation,

$$\frac{27^t}{3^{t-1}} = 3\sqrt{3}$$

Marks – 10

b.) Use Pascal's Triangle and expand the following.

$$(a+2b)^4$$

Marks – 05

c.) Write the Binomial Theorem and expand the following.

$$(-3x-4)^4$$

Marks – 10

Question 02

a.) Consider the following linear system.

$$x + 2y - 3z = 1$$
$$2x + 5y - 8z = 4$$
$$3x + 8y - 13z = 7$$

i.) Write the coefficient matrix.

ii.) Write the augmented matrix.

iii.) Find the solutions by using Gaussian Elimination method.

Marks – 10

b.) The functions f and g are defined,

$$f(x) = x^2 - 10x, x \in \mathbb{R}$$

$$g(x) = e^x + 5, x \in \mathbb{R}$$

i.) Find showing all steps in the calculation, the value of $g(3ln2)$.

ii.) Find, in its simplest form, an expression for $(f \circ g)x$

iii.) Show that,

$$g(2x) - (f \circ g)x = k,$$

stating the value of the constant k.

iv.) Solve the equation,

$$(g \circ f)x = 6$$

Marks – 20

[Total – 30 Marks]

Question 03

a.) Factorize the following quadratic functions and find roots.

i.) $f(x) = x^2 + 6x + 8$

ii.) $f(x) = x^2 - 3x + 2$

Marks – 06

b.) Find the roots by completing the square

$$3x^2 + 12x - 1$$

Marks – 04

c.) Prove the given statement.

$$n\,{}^{n-1}C_{r-1} = (n - r + 1)\,{}^{n}C_{r-1}$$

Marks – 05

[Total – 15 Marks]

Question 04

a.) Prove the following set statement.

$$(A \cup B \cup C) \cap (A \cap B' \cap C')' \cap C' = B \cap C'$$

Marks – 05

b.) Show clearly that the expression

$$1 - \frac{1}{x-2} + \frac{3}{x^2 - x - 2}$$

can be written in the form

$$\frac{x+a}{x+b}$$

where a and b are integer constants to be found.

Marks – 05

c.) Simplify the Boolean expressions,

i.) $XYZ + X\bar{Y}Z + XY\bar{Z} = X(Y + Z)$

ii.) $(X + Y)(X + \bar{Y})(\bar{X} + Z) = XZ$

Marks – 10

d.) Prove the following logic equivalent.

i.) $(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$.

ii.) $\neg(p \vee (\neg p \wedge q)) \equiv \neg p \wedge \neg q$.

Marks – 10

[Total – 30 Marks]

********** End Paper **********