MATHEMATICS 511

ASSIGNMENT

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# QUESTION 1

## truth table: F = (p ˅ q) ˄ (p → r) ˄ (¬r) → q

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **p** | **q** | **r** | (p ˅ q) | (p → r) | (p ˅ q) ˄ (p → r) | (¬r) | (¬r) → q | [(p ˅ q) ˄ (p → r)] ˄ (¬r) | (p ˅ q) ˄ (p → r) ˄ (¬r) → q |
| T | T | F | T | F | F | T | T | F | T |
| T | F | T | T | T | T | F | T | F | T |
| T | T | F | T | F | F | T | T | F | T |
| T | F | T | T | T | T | F | T | F | T |
| F | T | F | T | T | T | T | T | T | T |
| F | F | T | F | T | F | F | T | F | T |
| F | T | F | T | T | T | T | T | T | T |
| F | F | T | F | T | F | F | T | F | T |

⸫ The result for F is always true for every combination of truth value for p, q, and r.

Thus, the entire expression is a tautology, meaning it is always true regardless of the truth values of the individual variables p, q, and r

## 1.2Logical Equivalence Laws: ¬ (q → p) ˅ (p ˄ q) ≡ q

¬ (¬q →q) ˅ (p ˄ q) ≡ 2nd De Morgans Law

(q ˄ ¬p) ˅ (p ˅ q) ≡

q ˅ (¬p ˄ p) ≡ Associative Law

q ˅ F ≡ Negation Law

q ≡

## circuit diagram: F = y (x’ + z) + (y + xz)

Breakdown of the boolean formula: F = y ˄ (¬x ˅ z) ˅ y ˅ (x ˄ z)

Y

X

z

## QUESTION 2

## 2.1 functions:

F(x) = 3x + 6 and g(x) = 4x + k

F(g(x)) = 3(4x+k) + 6

=12x + 3k + 6

G(f(x)) = 4(3x + 6)

= 12x + 24 + k

F(g(x)) = G(f(x))

12x + 3k + 6 = 12x + 24 + k

(12x -12x) + (3k - k) + (6 - 24) = 0

2k – 18 = 0

2k = 18

2k/2 =18/2

⸫ k = 2

2.2 Sets

## 2.2.1 A – (B Ո C) = (A – B) Ս (A - C)

A – (B Ո C) = {a; e; i} – {u}

= {a; e; i}

(A – B) Ս (A - C) = {a; i; u} Ս {a; e; i; u}

= {a; e; i}

⸫ A – (B Ո C) = (A – B) Ս (A - C)

## 2.2.2 A Ո (B - C) = (A Ո B) – (A Ո C)

A Ո (B - C) = {a; e; i} Ո {e; o}

= {e}

(A – B) Ս (A - C) = {e} –{a; i}

={e}

⸫ A Ո (B - C) = (A Ո B) – (A Ո C)

2.3 Arithmetic series

Tn = a + (n-1)d

178 = -2 + ( n – 1 )d

178 = -2 + (9n -9)

178 + 9 = 9n

189/9 = 9n/9

⸫n= 21

( + )

=(-2 + 178)

⸫= 1848

## QUESTION 3

## 3.1 Crammers Rule

-x -2y -3z = 8

2x + z = 1

3x – 4y + 4z = 4

Coefficient of matrix

Main determinant:

*D =* *a(ei – fh) -b(di – fg) +c(dh – eg)*

a(ei – fh) = -1(0 x 4 – 1 x -4) = -4

-b(di – fg) = 2(0 x 4 -1 x -4 ) = 8

+c(dh – eg) = -3(2 x 4 – 0 x 3 ) = -24

D = -4 + 8 – 24 = -20

Finding , , :

a(ei – fh) = 8(0 x 4 – 1 x 4) = -32

-b(di – fg) = 2(1 x 4 – 1x 4) = 0

+c(dh – eg) = 3(1 x -4 – 0 x 4 ) = -12

a(ei – fh) = -1(2 x 4 – 1 x 3) = -5

-b(di – fg) = -1( 2 x 4 – 1 x 3) = -32

+c(dh – eg) = 3( 2 x 4 – 1 x 3) = 15

a(ei – fh) = -1 (0 x 4 – 1 x 4 ) = 4

-b(di – fg) = -2( 2 x 4 – 1 x 3 ) = -10

+c(dh – eg) = 8(2 x 4 – 0 x 3 ) = 40

Finding x, y, z:

## 3.2 Geometric progression

= 3066

## 3.3 Inverse Matrix Method

Matrix of minors:

Cofactor matrix:

Finding

Solving for X: