SLIATE

**SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION**

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

# Higher National Diploma in Information Technology

**First Year, First Semester Examination – 2016**

**HNDIT 1107 / HNDIT 11072: Mathematics for IT / Mathematics for Computing**

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| Instructions: | No. of questions: 05 |
| Answer four questions only. | No. of pages : 03 |
| All questions carry equal marks. | Time :Two(02) hours |

**Question 01** **[Total Marks 25]**

(i) Define the following terms with examples: (08 marks)

a) Set
b) Finite Set
c) Proper Subset
d) Null Set

(ii) Write the elements of the following sets. (06 marks)

a) $A = \{ x : x^2 \leq 5 \text{ and } x \in \mathbf{Z}\}$
b) $B = \{ x : 3x - 2 \leq 11 \text{ and } x \in \mathbf{N}\}$
c) $C = \{ a : a \in \mathbf{Z} \text{ and } a \notin \mathbf{N}\}$

(iii) Given $U=Z^+$

$A = \{x: x \text{ is an even integer and } x \leq 20\}$
$B = \{x: x \text{ is divisible by 3 and } x \leq 15\}$
$C = \{x: 2x-8=2\}$

Find

a) $A^c \cap C$ (02 marks)
b) $A \cap (C \cup B)$ (02 marks)
c) $B - A$ (02 marks)
d) $A \oplus B$ (02 marks)
e) $P(A \cap B)$ (03 marks)

**Question 02** **[Total Marks 25]**

(i) Among positive integers less than or equal to 50, let A be the set of even integers and B be the set of integers divisible by 5. How many integers are,

a) Even or divisible by 5 (02 marks)
b) Even and divisible by 5 (02 marks)

(ii) Suppose that A and B are two disjoint sets. Find

a) $A \setminus B$ (02 marks)

b) $A \cap B$ (02 marks)

(iii) Each student in a class of 60 plays at least one outdoor game; cricket, football or volleyball. 38 play cricket, 40 play volleyball and 47 play football. 27 play cricket and volleyball, 32 play volleyball and football, 24 play cricket, football and volleyball.

Find the number of students who play

a) Cricket and volleyball (04 marks)

b) Cricket, football but not volleyball (04 marks)

(iv) Show that $A \setminus (A \cap B) = (A \setminus B)$ using set theory laws (06 marks)

(v) Write the dual of $(B^C \cup \phi) \cup (A^C \cap U) = (A \cap B)^C$ (03 marks)

**Question 03** **[Total Marks 25]**

(i). "Every function is a relation but every relation is not a function". State whether the above statement is true or false by providing an example. (03 marks)

(ii). Given A = {1, 2, 3}, B = {x,y,z}, C ={a,b}. Let R be a relation from A to B. Let S be a relations from B to C

R = {(1, x),(1,y),(2,y),(2,z),(3,x)}
S = {(x,a),(y,a),(y,b)}

a) Draw an arrow Diagram for relation R (03 marks)

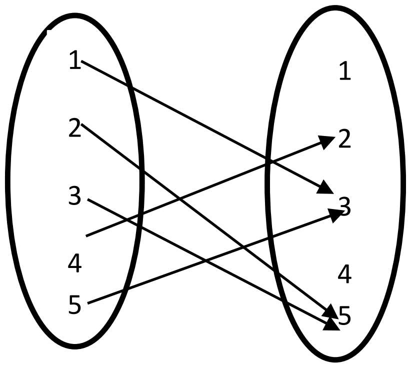
b) Find the Domain and Range of relation S (02 marks)

c) Find RoS (03 marks)

d) Find A x B (02 marks)

e) Find inverse relation of S (02 marks)

(iii) Let A= {1, 2, 3, 4, 5} and f: A→A be defined by the following.




Find,

a) Graph of f (02 Marks)

b) f(S) where S={3,4,5} (02 Marks)

c) $f^{-1}$ (T) where T={4,5} (02 Marks)

(iv) Find a formula for the inverse of g(x)=2x-3 / 5x-7 (04 Marks)

**Question 04** **[Total Marks 25]**

(i) Define the following matrices with examples:

a) Identity matrix

b) Skew symmetric matrix

c) Upper triangular matrix (06 marks)

(ii) Let $A = \begin{bmatrix} 1 & 3 \\ -4 & 2 \end{bmatrix}$ and B=$\begin{bmatrix} 3 & 0 \\ 1 & -2 \end{bmatrix}$ verify the AB≠BA (04 marks)

(iii) Let A = $\begin{bmatrix} 4 & x \\ 0 & 10 \end{bmatrix}$ , B = $\begin{bmatrix} -5/2 & -1 \\ 0 & y \end{bmatrix}$ and C = $\begin{bmatrix} 2 & 4 \\ 4 & 6 \end{bmatrix}$

If A + $B^{'} = C^{-1}$, find x and y (10 marks)

(iv) Find the inverse of the matrix A=$\begin{bmatrix} 1 & -2 & 0 \\ 3 & 1 & 5 \\ -1 & 2 & 3 \end{bmatrix}$ (05 marks)

**Question 05** **[Total Marks 25]**

(i) If A=$\begin{bmatrix} 3 & 1 \\ 0 & 2 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 5 \\ 1 & 2 \end{bmatrix}$ then, find the following (10 marks)

a) |A|

b) |B|

c) |A| x |B|

d) |AB|

(ii) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ \alpha & \beta & \gamma \\ \beta\gamma & \gamma\alpha & \alpha\beta \end{vmatrix} = (\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)$ (05 marks)

(iii) Solve the following system of linear equations using Cramer's rule. (10 marks)

$$\begin{aligned} x+2y+3z &= 4 \\ x+4y+9z &= 6 \\ x+y+z &= 3 \end{aligned}$$