

SOUTH EASTERN UNIVERSITY OF SRI LANKA
FIRST EXAMINATION IN BACHELOR OF INFORMATION AND
COMMUNICATION TECHNOLOGY - 2016/2017

SEMESTER – I, SEPTEMBER 2018

CMS11012- Mathematics for ICT

Answer all Questions.

Time: 02 hours

Question 01:

a) Write each of the following sets in the roster form:

- i. $A =$ set of all prime numbers less than 12.
- ii. $B = \{x | x \in \mathbb{N} \text{ and } x \text{ divides } 12\}$.
- iii. $C = \{x | x \text{ is a multiple of } 3 \text{ less than } 12\}$.

Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

[50 Marks]

b) Let $H = \{x : x \text{ is a 2 digit natural number such that the sum of its digits is } 4\}$.

Find the power set of H .

[20 Marks]

c) i. Write the set $\{x | 3 < x < 7 \text{ and } 2 < x \leq 4\}$ in the interval notation.

ii. Express $[(-\infty, 3) \cap [-1, 4)] \cup [2, 4)$ as a single interval.

[30 Marks]

Question 02:

a) Let $A = \{1, 2, 3, 4, 5\}$. Let R be a relation on A defined by $(x, y) \in R$ if and only if $-1 \leq x - y \leq 1$ for all $x, y \in A$. Write down the sets of all ordered pairs corresponding to the relation R and the inverse relation R^{-1} .

[25 Marks]

b) Write the relation matrix and draw the relation graph of R .

[40 Marks]

c) Let $B = \{1, 3, 5\}$. Define the relation S from A to B by $(a, b) \in S$ if and only if $a + b$ is even for all $a \in A$ and $b \in B$. List out set of all ordered pair corresponding to the relation S .

[15 Marks]

d) Find the composition relation $R \circ S$.

[20 Marks]

Question 03:

- a) Consider the relation R defined on the set $\{1, 2, 3, 4\}$ as

$$R = \{(1,1), (1,2), (2,1), (2,2), (3,2), (3,3), (4,1), (4,4)\}.$$

Is R (i) reflexive? (ii) symmetric? (iii) transitive? Justify your answers for each part.

[40 Marks]

- b) Define the relation S on the set of integers \mathbb{Z} as $(x, y) \in S$ if and only if $x - y$ is divisible by 4.

- Show that S is an equivalence relation on \mathbb{Z} .
- List out all equivalence classes, writing some elements for each class.
- The integer 31 belongs to which class? Explain.
- Write down the partition of \mathbb{Z} induced by the relation S .

[60 Marks]

Question 04:

The functions f and g are given by the expressions $f(x) = 2x + 5$ and $g(x) = \sqrt{x - 1}$ respectively.

- a) Write the natural domain and range of each of the functions.

[10 Marks]

- b) Evaluate

- $f^2(x)$,
- $(f \circ g)(x)$,
- $(g \circ f)(x)$

on the domains they are defined on.

Hence find the values of $(f \circ g)(10)$ and $(g \circ f)(6)$.

[50 Marks]

- c) i. Show that f is both one-to-one and on-to on its natural domain and range.
ii. Find the inverse function f^{-1} .

[40 Marks]