SOUTH EASTERN UNIVERSITY OF SRI LANKA
FIRST EXAMINATION IN BACHELOR OF INFORMATION AND COMMUNICATION TECHNOLOGY - 2018/2019
SEMESTER – I, JULY / AUGUST 2021

CMS 11012 – MATHEMATICS FOR ICT

Answer all Questions **Time Allowed: 02 hours.**

Question 01:

(a) 900 professional footballers were surveyed with the following results:

- 200 have a swimming pool
- 305 have a second home
- 120 have a boat
- 30 have a swimming pool and a second home
- 45 have a boat and a second home
- 32 have a boat and a swimming pool
- 16 have all three.

(i) Let P to represent the set of footballers who have a swimming pool, H the set of footballers who have a second home and B the set of footballers who have a boat. Draw a Venn diagram to show this information.

(ii) Write down the number of footballers that have a swimming pool only.

(iii) Write down the number of footballers that have a swimming pool and a boat but no second home.

(iv) Write down $n[B \cap (H \cup P)']$.

(v) Calculate the number of footballers who have none of the three.

(b) What will be the Cardinality of the Power Set of $\{0, 1, 2 \ldots, 5\}$?

You need not to list out the elements of the power set.

(c) Write the numbers represented by the set $\{x \mid 4 < 2x + 9 \leq 5\}$ in an interval notation.

[Total 100 marks]

Question 02:

(a) Let R be the relation on a set $\{a, b, c\}$ represented by the matrix

$$M_R = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$

(i) Write the range of the relation R.

(ii) Draw the digraph of R.

(iii) Is the relation R reflexive and/or symmetric? Explain.

(b) Let $A = \{0, 1, 2, 3\}$. Define a relation S on A such that

$$(a, b) \in S \quad \Leftrightarrow \quad a + b \in A \quad \text{for all} \quad a, b \in A$$

(i) Write the elements of S in roaster form.

(ii) Write the matrix representation of S.

(iii) Decide whether S is reflexive, symmetric, transitive and whether is an equivalence relation? Justify your answers.

[Total 100 marks]

Question 03:

(a) The relation R on the set of all integers $\mathbb{Z}$ is defined as

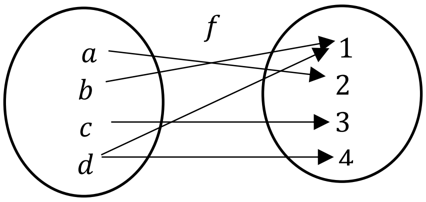
$$_{m}R_{n} \quad \Leftrightarrow \quad |m| = |n| \quad \text{for all} \quad m, n \in \mathbb{Z}.$$

Show that R is an equivalence relation $\mathbb{Z}$.

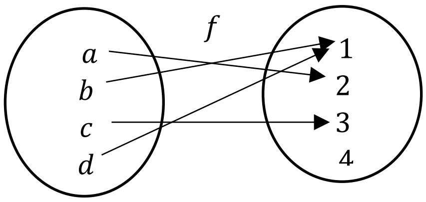
Find the partition of $\mathbb{Z}$ induced by R.

(b) Determine if the following relations are functions or not. In the case of a function, write its domain and range. Otherwise, give a reason why it is not a function.

(i)



(ii)



(iii) $R = \{(0,3), (1,5), (2,7), (3,9)\}$.

[Total 100 marks]

Question 04:

(a) If $f(x) = -2x + 5$ and $g(x) = x^2 + 3$ are the real functions, find each of the following:

(i) $(f + g)(2)$.

(ii) $(fg)(x)$.

(iii) $(f \circ g)(x)$.

(b) Show that the function $F\colon \mathbb{R} - \{0\} \longrightarrow \mathbb{R} - \{1\}$ given by

$$f(x) = \frac{x + 1}{x}$$

is bijective and find its inverse.

[Total 100 marks]

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