SOUTH EASTERN UNIVERSITY OF SRI LANKA

FIRST EXAMINATION IN BACHELOR OF INFORMATION AND COMMUNICATION TECHNOLOGY - 2021/2022

SEMESTER - I, APRIL/MAY - 2024

CMS 11012 - Mathematics for ICT

Answer All Questions **Time: Two (02) Hours**

INSTRUCTIONS TO CANDIDATES:

- Write your Index No clearly in all places where appropriate.
- Write clearly in English and use blue or black ink.
- Calculators are **NOT ALLOWED** in this examination.
- Strike a line through all unused pages in the answer booklet/sheets.
- Marks given in brackets are indicative of the weight given to each part of the question.

Question 01:

a) Solve the following equations:

i. $8 \times 3^{x+1} = 216$,

ii. $7 \times 5^{-x} = \frac{7}{125}$.

(10 Marks)

b) John works two jobs. His weekday job pays him \$20 per hour, and his weekend job pays him \$30 per hour. In one week, he worked a total of 40 hours and earned \$900. How many hours did he work at each job?

(20 Marks)

c) Write each of the following set in the roaster form:

i. $A = \{x \mid x^2 + 2x - 15 = 0\}$,

ii. $B = \{x \mid x \text{ is a letter in the word "telecommunication"}\}$,

iii. $C = \{x \mid x \in N, x \text{ is odd number}, -3 \leq x \leq 15\}$,

iv. $D = \{x \in N \mid x + 15 = 10\}$.

(20 Marks)

d) Operating System usage in a company of 350 employees are given below:

- 160 use Windows.
- 130 use MacOS.
- 150 use Linux.
- 60 uses both Windows and MacOS.
- 70 uses both Windows and Linux.
- 50 uses both MacOS and Linux.
- 40 uses all three operating systems.

i. Fill in the correct number of people in each of the **eight regions** of the Venn diagram using W, M, and L denote the set of people who uses Windows, MacOS and Linux respectively.

ii. How many employees use only one operating system?

iii. How many employees use at least two operating systems?

iv. How many employees do not use any of these operating systems?

(50 Marks)

[100 Marks]

Question 02:

a) A shelf contains 8 novels, 5 science books, and 7 history books. A single book is selected at random. Find the probability **p** that the selected book is:

i. A novel.

ii. A science book.

iii. Not a history book.

iv. Either a novel or a history book.

(20 Marks)

b) In a company, 60% of the employees use Facebook (F), 35% use Instagram (I), and 25% use both Facebook and Instagram. An employee is selected at random.

i. If the employee uses Instagram, find the probability that the employee also uses Facebook.

ii. If the employee uses Facebook, find the probability that the employee also uses Instagram.

iii. Find the probability that the employee uses Facebook or Instagram.

iv. Find the probability that the employee uses neither Facebook nor Instagram.

(40 Marks)

c) There are 8 people, and you want to place them in a row for a photograph.

i. In how many ways can you arrange all 8 people in a row?

ii. In how many ways can you arrange 5 of these people in a row?

(20 Marks)

d) A company has 12 employees, consisting of 7 engineers and 5 designers. Find the number of ways to:

i. Select a 5-member project team from the employees.

ii. Select a 5-member project team with 3 engineers and 2 designers.

(20 Marks)

[100 Marks]

Question 03:

a) Let $f: \mathbf{R} \rightarrow \mathbf{R}$ be defined by $f(x) = \frac{3x}{2} + 10$. Find the formula for the inverse function $f^{-1}: \mathbf{R} \rightarrow \mathbf{R}$.

(10 Marks)

b) Let $f: \mathbf{R} \rightarrow \mathbf{R}$ and $h: \mathbf{R} \rightarrow \mathbf{R}$ be defined by $f(x) = 3x - 4$ and $h(x) = x^2 + 5$. Find the formula for the composition functions:

i. $(f \circ h)(x)$

ii. $(h \circ f)(x)$

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

iv. $(h \circ h)(x)$

v. Show that $h(x)$ is not a one-to-one function.

(50 Marks)

c) Consider the relation R defined on the set S={m, n, o, p, q} as R={(m, n), (n, o), (n, n), (m, m), (o, p), (o, o), (p, q), (p, p), (o, n), (n, m), (p, o), (q, p), (q, q)}. Is the relation R,

i. Reflexive?

ii. Symmetric?

iii. Transitive?

iv. Equivalence? Justify your answers for each scenario.

(40 Marks)

[100 Marks]

Question 04:

a) Determine the values of each of the following limits:

i. $\lim_{x \to 5} \frac{x^2 - 25}{x^2 + 5x - 50}$,

ii. $\lim_{x \to 4} \frac{\sqrt{2x+1} - 3}{x - 4}$,

iii. $\lim_{x \to 2} \frac{\frac{1}{x} - \frac{1}{2}}{x - 2}$.

(30 Marks)

b) Using the **first principles (definition of a derivative)** differentiate the function

$$f(x) = 5x^2 - 3x + 7.$$

(20 Marks)

c) Differentiate the following with respect to the independent variables of each function.

i. $f(t) = (5t^2 + 3)^4$

ii. $g(x) = (x^2 + 6)(3x - 2)$

iii. $h(x) = \frac{5x^2 - 4x + 8}{2x + 5}$

(30 Marks)

d) Calculate the 3rd derivative $\frac{d^3y}{dx^3}$

$$y = 5x^5 - 3x^3 + 2x^2 + 8x - 5.$$

(20 Marks)

[100 Marks]

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