SOUTH EASTERN UNIVERSITY OF SRI LANKA

057

FIRST EXAMINATION IN BACHELOR OF INFORMATION AND COMMUNICATION TECHNOLOGY - 2019/2020

SEMESTER – I, AUGUST 2022

CMS11012 – Mathematics for ICT

Answer All Questions **Time Allowed: 02 hours**

Question 01

a. Write each of the following sets in the roaster form:

i. A = set of even numbers less than 11.

ii. $B = \{x | x \in N, x \text{ is a multiple of 3 and less than 20}\}$.

iii. $C = \{x | x = 2^n, n \in N \text{ and } n \leq 4\}$.

Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$. (30 Marks)

b. Prove $(A \cup B) \backslash (A \cap B) = (A \backslash B) \cup (B \backslash A)$ by using the Laws of Algebra of Sets and $X \backslash Y = X \cap Y'$. (20 Marks)

c. Among a group of students, 50 played cricket, 50 played hockey and 40 played volley ball. 05 played both cricket and hockey only, 10 played both hockey and volley ball only.05 played cricket and volley ball only and 10 played all three. If every student played at least one game,

i. find the total number of students in the group.

ii. how many played only cricket ?

iii. how many played only hockey ?

(30 Marks)

d. In how many ways can a bunch of 2 roses and 3 lilies be made out of a total of 7 roses and 8 lilies? (20 Marks)

Question 02

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 scenario. (30 Marks)

b. Let p be "It is cold' and let q be "It is raining". Give simple verbal sentences which describes the following statements:

i. $\neg p$

ii. $p \wedge q$

iii. $p \vee q$

iv. $q \vee \neg p$ (20 Marks)

c. Show that propositions $\neg(p \wedge q)$ and $\neg p \vee \neg q$ are logically equivalent. (20 Marks)

d. Verify that proposition $p \vee \neg(p \wedge q)$ is a tautology. (30 Marks)

Question 03

a. A shop repaired 40 vehicles of both cars and motorcycles in a month. The total number of wheels of such repaired vehicles was 100. How many cars and motor cycles were repaired? (25 Marks)

b. A man loses 20% of the money he had. After spending ¼ of the remaining money, he is left with Rs. 480/=. How much did he have initially? (25 Marks)

c. Solve the following

i. $(\frac{1}{6})^{-3x-2} = 36^{x+1}$

ii. $9 \times 3^{x+1} = \frac{1}{27}$ (25 Marks)

d. If $x = \frac{\sqrt{3}}{2}$, then find the value of $\frac{\sqrt{1+x}}{1+\sqrt{1+x}} + \frac{\sqrt{1-x}}{1-\sqrt{1-x}}$ (25 Marks)

Question 04

Let f, g be two functions defined from $\mathbb{R}$ to $\mathbb{R}$ by

$$f(x) = x^2 + 3, \qquad g(x) = 3x + 2,$$

for all $x \in \mathbb{R}$.

a. Evaluate

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

ii. $f^2(x) = (f.f)(x)$,

iii. $(f\ o\ g)(x)$,

iv. $(g\ o\ f)(x)$,

v. $(f\ o\ f)(x)$.

on the domains they are defined on.

Hence find the values of $(f\ o\ g)(10)$ and $(g\ o\ f)(6)$. (60 Marks)

b.

i. Show that f is not one to one.

ii. Prove that g is one to one and onto. (40 Marks)