Strathmore
UNIVERSITY

Strathmore Business School
Bachelor of Science in Supply Chain and Management
NOVENBER - MARCH 2022 Group
End of Semester Examination
MAT 1201- Business Mathematics

Date: Monday, $21^{st} March$ 2022 Time: 2 Hours

Instruction

1. Answer **QUESTION ONE** and any other **TWO QUESTIONS**

QUESTION ONE [30 Marks]

a) Out of 51 students in a class, 26 are taking Japanese language and 34 are taking Chinese. If 14 are in both classes, determine how many are taking neither and how many are taking either? [3 Marks]

b) The ages of three children can be expressed as consecutive integers. The square of the age of the youngest child is 4 more than eight times the age of the oldest child. Find the ages of the three children.
. [4 Marks]

c) An oil company bores a hole $80m$ deep. Estimate the cost of boring if the cost is 30 Pounds for drilling the first metre with an increase in cost of 2 Pounds per metre for each succeeding metre. [3 Marks]

d) For each of the functions $g(x) = \sqrt{x} + \frac{1}{x-8}$ and $h(x) = \frac{1}{x^2}$, state the domain, range and whether the function is *one to one* or *many to one* function. [4 Marks]

e) Given that $A = \{\emptyset, 0, 1, \{2\}\}$, $B = \{\{\emptyset\}1, 2, \{2\}, \{0\}\}$, $C = \{0, 2, 3, 1, \{\emptyset\}\}$ and $D = \{1, 2, 0, \emptyset, 3, \{0, \emptyset\}\}$. Determine:

i. $A \cup B$ [1 Mark]

ii. $A \cap C$ [1 Mark]

iii. $B \oplus D$ [1 Mark]

iv. $(A - B) \cup (B - A)$ [2 Marks]

f) A plot of land for sale has a length of p metres., and a width that is 8 metres less than its length. A farmer will only purchase the land if it measures 240 square metres. What value of p will make the farmer purchase the land?
. [2 Marks]

g) Solve for a and b by matrix method given that $5a + 3b = 41$ and $2a + 3b = 20$. [4 Marks]

h) In a class, there are 27 boys and 14 girls. The teacher wants to select 1 boy and 1 girl to represent the class for a competition. In how many ways can the teacher make this selection? [3 Marks]

i) Stocks of a company are initially issued at the price of 18 Dollars. The value of the stock grows by 20% annually. Calculate the value of the stock ten years after the initial public offering correct to two places of decimal. [2 Marks]

QUESTION TWO [20 Marks]

a) A survey on 41 new cars on sale was conducted to find out which of the three popular options; air conditioning (A), radio (R) and power windows (W) were already installed. The survey found that:
15 had A,
12 had R,
11 had W. Further,
5 had A and W,
9 had A and R,
4 had R and W.
Three had all the three.
Find the number of cars that had: A *or* W, A and R but not W, at most two of the options, at least one option and finally, none of the options. [4 Marks]

b) The sets L, M and N in a universal set consisting of the first ten lower case letters of the alphabet are $L = \{a, b, c, j\}$, $M = \{b, c, a, e\}$ and

$N = \{a, d, e, f\}$. Determine the members of the following sets: $M \cup N$, $L \cup N$, L^c, $L \cap M \cap N$, $(L \cup M \cup N)^c$ and $M \cap N$. [5 Marks]

c) Represent on a Venn diagram the region represented by $(A^c \cap B^c \cap C^c)^c$, $(A \cup B \cup C)^c$, $A \triangle B$ and $A \oplus B$. [6 Marks]

d) An arithmetic sequence has the fifth term as 13.5 and the twelfth term as 31. Find its first term, common difference and the sum of its first nine terms [5 Marks]

QUESTION THREE [20 Marks]

a) A store has 8 regular door ways and 5 emergency doors which can be opened only from the inside. In how many ways can a person enter and leave the store? [3 Marks]

b) Out of the letters P, Q, R, x, y and z, how many arrangements can be made
(i) beginning with a capital [2 Marks]
(ii) beginning and ending with a capital. [2 Marks]

c) Out of 17 consonants and 5 vowels, how many different words can be formed each containing 3 consonants and 2 vowels? [3 Marks]

d) From 6 boys and 4 girls, a committee of 6 is to be formed. In how many ways can this be done if the committee contains
(i) exactly 2 girls, or [2 Marks]
(ii) at least 2 girls? [2 Marks]

e) A train travels at a certain average speed for a distance of $63km$ and then travels a distance of $72km$ at an average speed of $6km/h$ more than its original speed. If it takes 3 hours to complete the total journey, what is its original average speed? [3 Marks]

f) Difference between a number and its positive square root is 12. Find the number. [3 Marks]

QUESTION FOUR [20 Marks]

a) Suppose $f(x) = \frac{1}{x+2}$ and $g(x) = \frac{4}{x-1}$, find the domain,range and inverse of $f \circ g$. [6 Marks]

b) Given $A = \{1, 2, 3, 4\}$;

i. Find the cardinality of B if it is the family of subsets of A which contain exactly three elements of A. [2 Marks]

ii. List the members of C if it is the collection of subsets of A each which contains 2 and two other elements of A. [2 Marks]

c) Find the sum of the terms of the arithmetic progression $10, 15, 20, \cdots,$ 1000. [6 Marks]

d) Given that $f(x) = x + 3$ for $x \geq 0$ and $g(x) = x^2$ for $-2 \leq x \leq 3$. Determine the range of $f \circ g$. [4 Marks]

QUESTION FIVE [20 Marks]

a) Find y' given that:

i. $y = -\frac{2}{3}(x^2 - 2)^{\frac{2}{3}}$ [2 Marks]

ii. $y = (x + 3)^{-56}(3x - 7)^{0.5}$ [3 marks]

iii. $y = \frac{x - 5x^3}{5 - 2x}$ [3 Marks]

b) List the first five terms of the sequence $\{U_n\}$ defined by $u_1 = 1$ and $u_n = (u_1 \times u_2 \times u_3 \times \cdots \times u_{n-1}) + 1$ for $n \geq 2$. [4 Marks]

c) Evaluate the following limit: $\lim_{x \to -4} \frac{\sqrt{x^2+9}-5}{x+4}$ [5 Marks]

d) Find the sum of all the natural numbers between 100 and 1000 that are divisible by 5 excluding 100 and 1000. [3 Marks]