Strathmore Institute of Management and Technology
Diploma in Entrepreneurship and Business Creation(AL JAMEA CLASS)
End of Semester Examination
DE 1106- Business Mathematics

Date: 15^{th} *December* 2021 Time: 2 Hours

Instruction

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

QUESTION ONE [30 Marks]

a) Is it true that all integers are rationals? If so why? [2 Marks]

b) Given $A = \{a, 1, 2, 0, \emptyset\}$, $B = \{1, 3, \{0\}, \{\emptyset\}, 0\}$ and $C = \{a, b, 1, 2, 0, \emptyset\}$ with the universal set $E = \{a, 1, 2, \emptyset, 0, 3, 4, 5, 6, d, f, \{0\}, \{\emptyset\}\}$ determine:

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

ii. $A^c \cup C^c$ [1 Mark]

iii. $B \cup (A \cap C)$ [1 Mark]

c) In a class of 54 students, each of the students passed either in Mathematics or in Science. Ten students passed in Mathematics and Science while 28 passed in science. Find how many students passed in mathematics if three did not pass in either ? [3 Marks]

d) Solve the given simultaneous equation using the matrix method:
. [5 Marks]

$$3y + 2x = 13$$
$$5x + 2y = 16$$

e) The sum of two numbers is 79 and their difference is 25. Find the two numbers by setting up simultaneous equations and solving them using substitution method. [3 Marks]

f) 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]

g) Stocks of a company are initially issued at the price of $K.sh.10$. The value of the stock grow by 25% every year. Show that the value of a stock follows a geometric sequence. Calculate the value of the stock ten years after the initial public offering. [4 Marks]

h) Solve for x in $3x^2 - 5x - 8 = 0$ [3 Marks]

i) In how many ways can a committee of six women and seven men be selected from a group of eight women and nine men. [2 Marks]

QUESTION TWO [15 Marks]

a) In a survey of university students, 64 had taken Mathematics course, 94 had taken Chemistry course, 58 had taken Physics course, 28 had taken Mathematics and Physics, 26 had taken Mathematics and Chemistry, 22 had taken Chemistry and Physics course, and 14 had taken all the three courses. Find:

i. How many had taken one course only? [2 Marks]

ii. How many had taken Mathematics and Physics but not Chemistry. [1 Mark]

iii. How many had taken at least one course? [1 Mark]

iv. How many had taken at most two courses? [1 Mark]

v. How many had taken Chemistry or Physics? [1 Mark]

b) List the elements of the following sets hence give their cardinalities where possible.

i. $T = \{x : 1 \leq x < 4, x \in \mathbb{Z}\}$ [2 Marks]

ii. $W = \{y : 1 \leq y \leq 7, y \in \mathbb{Q}\}$ [2 Marks]

c) Shade the region represented by the following on a Venn diagram.

i. $(A \cup B)^c$ [1 Mark]

ii. $B - A$ [1 Mark]

iii. $A \cap B$ [1 Mark]

d) Given that $T = \{a, b, c, 1, 2, 3, h, l\}$ and $S = \{1, 2, 3, b, a, d, f\}$, find $T \oplus S$. [2 Marks]

QUESTION THREE [15 Marks]

a) The numerator of a fraction is 3 less than its denominator . If 2 is added to both the numerator and its denominator, the sum of the new fraction and original fraction is $\frac{29}{20}$. Find the original fraction.
. [3 Marks]

b) Two runners start from the same point at the same time. They will be 4 miles apart at the end of two hours if running in the same direction, and they will be 16 miles apart at the end of one hour if running in opposite directions. Find their speeds. [3 Marks]

c) If twice the son's age in years is added to the father's age, the sum is 70. But if the father's age is added to the son's age, the sum is 95. Find the ages of father and son. [3 Marks]

d) 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]

e) A rectangle has a length that is 2 less than 3 times the width. If the area of this rectangle is 16, find the dimensions and the perimeter.
. [3 Marks]

QUESTION FOUR [15 Marks]

a) Use the matrix method to solve for x and y in [4 Marks]

$$-2y + 2x - 3 = 0$$
$$8y = 7x + 2$$

b) Determine two consecutive negative even integers whose product is 24 . [3 Marks]

c) In a certain international company, 0.85 of the people speak Thai, 0.40 speak Ewe and 0.20 speak Hausa. Also 0.32 speak Thai and Ewe, 0.13 speak Thai and Hausa and 0.10 speak Ewe and Hausa, find the percentage of people who can speak all the three languages. [4 Marks]

d) A bakery produces two types of bread, $festive$ and $super\ loaf$ The respective processing times each batch on the dough-making machine are 12 minutes and 15 minutes respectively. While the oven baking times are 16 minutes and 12 minutes respectively. How many batches of each type should be processed in an 8 hour shift so that the dough making machine and the oven are fully occupied? [4 Marks]

QUESTION FIVE [15 Marks]

a) How many different car number plates are possible if three letters are followed by three digits? (We use the English alphabet excluding O and I). [3 Marks]

b) How many of the plates in (a) above begin with ABC? [2 Marks]

c) A debating club has five members. In how many ways can the captain and his deputy be chosen if one of the members is not interested in any position? [2 Marks]

d) In how many ways can the five members in (c) above be arranged in a row for a photo session? [2 Marks]

e) From the digits $2, 3, 4, 5$ and 6, how many numbers greater than 4000 can be formed and how many of those numbers formed are even? . [4 Marks]

f) At a dinner party with six ladies and six men are to sit at a round table. In how many ways can this be done:

i. If there are no restrictions? [1 Mark]

ii. ladies and men alternate? [1 Mark]