KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST SEMESTER, 2019/2020 ACADEMIC YEAR

EXAMINATION FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF EDUCATION ARTS AND SCIENCE

MATH 110 BASIC MATHEMATICS

STREAM: Y1S1 **DATE: 17/12/2019**

EXAMINATION SESSION: SEP-DEC **TIME: 2:00-4:00PM**

INSTRUCTIONS

(i) **Attempt ONE and any other TWO questions**

(ii) **Do not write on the question paper**

(iii) **Show your working clearly**

QUESTION ONE (30MARKS)

a) Distinguish between the following

ii) Finite and infinite sets [1 Mark]

iii) A series and a sequence [1 Mark]

b) Given that set $A = \{ a, b, c, d, e, f, g \}$ set $B = \{ a, e, o, u \}$ and set $C = \{ a, c, g \}$

Find:

i. $A \vee B \vee C$ [1 Mark]

ii. Power set of set C [3 Marks]

c) The third, fourth and fifth terms of a G.P are 20, 40 and80 respectively. Calculate the common ratio and the first term. [4 Marks]

d) Find the sum of the first 10 terms of the Progression. 2, 9, 16, 23, 30, ... [3 marks]

e) In triangle ABC, $a = 9$, $b = 7.5$ and $c = 6.5$. Determine all the angles [3 Marks]

f) in how many ways can the letters or numbers of the following words or numbers be arranged

i) EXCELLENCE

ii) 0722200057 [2 Marks]

g) Expand $(5 + x)^4$ and simplify your answer. Use your expansion to evaluate 5.02^4 correct to two decimal places. [3 Marks]

h) Solve the equation $2\sin^2 x + 3\cos x - 3 = 0$ [3 Marks]

i) Express $\frac{6-3i}{2+7i}$ in the form a+b**i** [3marks]

j) Use truth tables to verify that compound propositions $\sim (p \wedge q)$ and $\sim p \vee \sim q$ are logically equivalent [3 marks]

QUESTION TWO (20MARKS)

Suppose p and q are true statements, while r is a false statement. Determine the truth value of

i. $\sim qVr$ [1 mark]

ii. $\sim(r \vee q)$ [1 mark]

iii. $\sim[(p \wedge \sim r) \vee q]$ [1mark]

Use laws of logic to

i) Simplify the expression $p \vee \sim(\sim p \rightarrow q)$ [3 Marks]

ii) Show that the compound proposition $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology [4 Marks]

b) The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a geometric progression. If the first term of the arithmetic progression is10 find the common difference of the arithmetic progression. [4 Marks]

c) The geometric sequence is given by $a, ar, ar^2, ar^3, ..., ar^{n-1}$. Show that the sum of the first n terms of this sequence is , $S_n = \frac{a(1-r^n)}{1-r}$ when $r \neq 1$ [3 Marks]

d) A geometric series consist of four terms and has a positive common ration. The sum of the first two terms is 8 and the sum of the last two terms is 72. Find the series. [3 Marks]

QUESTION THREE (20MARKS)

a) Given that $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ $B = \{1, 5, 9, 15, 21\}$ and $C = \{2, 3, 9, 15, 17, 18, 19\}$ Find $A - (B \oplus C)$ [2 Marks]

b) In a survey of 800 first year university students, the following data were obtained. 295 were enrolled to study Sciences, 325 were enrolled to study Law, 360 were enrolled to study Arts, 35 were enrolled to study all the three, 100 were enrolled to study sciences and law, 110 were enrolled to study sciences only and 150 were enrolled to study Law only.

Required

(i) A Venn diagram showing the above information [5 marks]

(ii) The number of students enrolled to study Arts only. [1 mark]

(iii)The number of students who were enrolled to study at least two of the courses [2 marks]

c) Find the middle terms in the expansion $\left(\frac{3}{4}x+\frac{4}{3}y\right)^{20}$ [3 marks]

d) The term independent of x in the expansion $\left(x-\frac{1}{x}\right)^{14}$ [3 marks]

e) Product in thousand kilograms of a certain firm in the first, second, third etc weeks is the as the coefficients of the first, second, third etc powers of x in the expansion of $(1+x)(1-x)^{-2}$. Find the production in the sixth year. [4 marks]

QUESTION FOUR (20MARKS)

a) Given that $f(x)=1-x$ and $g(x)=7x-5$ find

i) $(f\circ g)(x)$ [2 Marks]

ii) The inverse of $g(x)$ [2 Marks]

b) Evaluate; $\frac{(n+1)!}{n!}$ [2 Marks]

c) Solve the equation ${}^{x}C_{2}=45$ [2 Marks]

d) In how many ways can a committee of 5 be chosen from 9 candidates so as to include both the youngest and the oldest candidates [2 marks]

e) In how many different ways can 3 software be supplied to 5 clients if

(i) No client receives more than software? [2 marks]

(ii) Any client may receive any number of software? [2 marks]

f) Find all the six 6^{th} roots of unity that is solve $z^6=1$ and represent the solution on and Arg and diagram [6 Marks]

QUESTION FIVE (20MARKS)

How many arrangements of the letters of word REMAND are possible if;

i. There are no restrictions

[2mks]

ii. They begin with RE

[2mks]

iii. They do not begin with RE

[2mks]

iv. They have REM together in any order

[2mks]

Simplify each of the following

i. $tan^2\theta cos^2\theta + cot^2\theta sin^2\theta$

[4mks]

ii. $\tan\theta + \frac{\cos\theta}{1+\sin\theta}$

[4mks]

Find the sum of the geometric progression: $\frac{1}{\sqrt{3}}, 1, \sqrt{3}, \ldots \ldots, 81.$