UGANDA BUSINESS AND TECHNICAL EXAMINATIONS BOARD

Business and Humanities Certificate Examinations

MAY-JUNE 2020 SERIES

PROGRAMME

NATIONAL CERTIFICATE IN INFORMATION AND COMMUNICATIONS TECHNOLOGY

PAPER NAME

COMPUTATIONAL MATHEMATICS

PAPER CODE

NCIT123

YEAR I, SEMESTER II

2½ HOURS

MONDAY, 19TH APRIL, 2021

INSTRUCTIONS TO CANDIDATES

1. *This paper consists of **seven** questions.*
2. *Answer only **five** questions.*
3. *All answers to each question should begin on a fresh page.*
4. ***Do not** write on the question paper.*
5. *All rough work should be done in the official answer booklet provided.*
6. *Non-Programmable electronic calculators and graph papers may be used for this examination.*
7. *Read other instructions on the answer booklet.*

Question One

(a) Given that A and B are independent events such that $P(A \cup B) = 0.8$ and $P(A \cap B) = 0.1$. Find the possible values of $P(A)$ and $P(B)$. (10 marks)

(b) Two fair dice each numbered 1 to 6 are simultaneously tossed in an experiment and the sum of their outcomes noted.

Determine the probability that the sum;

(i) Is either a 3 or a prime number. (04 marks)

(ii) Is a composite number. (03 marks)

(iii) Exceeds 8 by at least 2. (03 marks)

Question Two

(a) Given that matrix P= $\begin{pmatrix} 3 & 4 \\ 5 & 7 \end{pmatrix}$. Find matrix Q such that $PQ = \begin{pmatrix} 7 & 0 \\ 0 & 7 \end{pmatrix}$. (07 marks)

(b) Given that matrix A = $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 0 & 2 \\ 7 & 1 & 0 \end{pmatrix}$ and B = $\begin{pmatrix} 0 & 2 & 1 \\ 4 & 0 & 3 \\ 1 & 1 & 4 \end{pmatrix}$.

(i) Find AB and BA. (06 marks)

(ii) Comment on your results above. (02 marks)

(c) Find the determinant of a matrix A = $\begin{pmatrix} 2 & -4 & 6 \\ 1 & -3 & 3 \\ 0 & -4 & 5 \end{pmatrix}$ (05 marks)

Question Three

(a) Find the first derivatives of the following functions.

(i) $\frac{x^2+1}{2x+4}$. (03 marks)

(ii) $x^5 - \frac{3}{x^2} + 6x$. (03 marks)

(iii) $(3x^3 - 2x)^3$. (06 marks)

(b) Solve the equation $2y\frac{dy}{dx} + x + 1 = 0$ given that when $x = 2, y = 1$. (04 marks)

(c) Evaluate $\int_{-1}^{2}(x^3 - {}^{2}/_{x^2} - 4)\,dx$. (04 marks)

Question Four

The flow charts in **Fig. 1** involve summations.

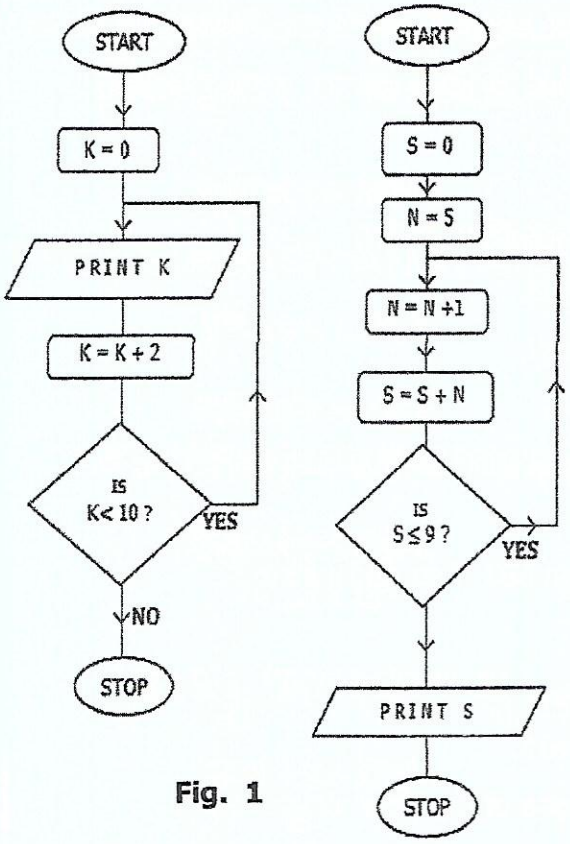

Fig. 1

For each flow chart,

(a) Perform a dry run. (10 marks)

(b) Write the program or the algorithm. (10 marks)

Question Five

(a) Two events A and B are such that $P(A' \cap B) = 0.4$, $P(A \cup B) = 0.9$, and $P(A \cap B) = 0.2$.

Find;

(i) $P(B)$ (02 marks)

(ii) $P(A)$ (02 marks)

(iii) $P(A' \cup B)$ (02 marks)

(iv) $P(A' \cap B')$ (02 marks)

(v) $P(A' \cup B')$ (02 marks)

(b) A body starts with an initial velocity of $5ms^{-1}$ and its acceleration is given by $6 + 4t\ ms^{-2}$. Where t is the time from the start. Find in terms of t, the;

(i) Expression for the velocity and hence calculate the velocity when $t = 2s$. (04 marks)

(ii) Expression for the distance travelled, and hence calculate the distance travelled in 6 seconds. (06 marks)

Question Six

For the program or algorithm below;

1. Start N at zero.
2. Start S at zero
3. Add one to N.
4. Is N a multiple of 3? If it is Not, Go to step 6.
5. Add N to S.
6. Is N less than 50? If so go to step 3.
7. Print S

(a) Draw a flow chart. (13 marks)

(b) Perform a dry run. (05 marks)

(c) State the purpose of the flow chart. (02 marks)

Question Seven

(a) Use determinants to solve the equation

$2x + 3y = 4$

$3y = 4x - 2$ (10 marks)

(b) Given that matrix $P = \begin{pmatrix} x & -6 \\ -4 & x-2 \end{pmatrix}$ is a singular.

Find the possible values of x. (05 marks)

(c) Given matrices $A = \begin{pmatrix} x^2 - 1 & -3 \\ 1 & y \end{pmatrix}$ and $B = \begin{pmatrix} -4 & \frac{3}{2} \\ \frac{-1}{2} & 2+y \end{pmatrix}$

Find the values of x and y such that $A + 2B = 0$. (05 marks)

END