MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR THIRD SEMESTER EXAMINATION FOR

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

2906/102- COMPUTATIONAL MATHEMATICS

DATE: 18/12/2020   **TIME: 11.30-2.30 PM**

INSTRUCTIONS

You should have the following for the exam
  A scientific calculator
  A graph paper
This paper consists of 8 questions.
Answer any five of the eight
All questions carry equal marks
Candidates should answer questions in English.

1.   a)   identify each of the following types of matrices   (4 marks)

$$W=\begin{pmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{pmatrix}; \quad X=\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}; \quad Y=\begin{pmatrix} 4 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 2 \end{pmatrix}; \quad Z=\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

     b)   Explain two advantages of interview as a method of data collection   (4 marks)

     c)   A marketing committee comprises of 6 women and 6 men intends to hold a meeting while seated in a line. Determine the number of ways in which they can be seated if:

          i.   all men are seated together and all women are to be seated together

          ii.   the first seat is preserved for a woman and no two women should be seated next to one another

          iii.   the outermost positions to be occupied by men   (6 marks)

     d)   Convert each of the following number system to equivalent number systems

      i. 364_8 to binary

      ii. $4C6F_{16}$ to decimal

      iii. 375_8 to hexadecimal   (6 marks)

2.   a)   State each of the following rules as used in finite sets using mathematical notations:

      i.   union rule

      ii.   product rule   (4 marks)

    b)   Distinguish between rounding off a number and truncating a number using the

        45.56789, to 3 decimal places   (4 marks)

    c)   i.   plot each of the following equations on one graph.

          I) $2x - 3y = -4$

          II) $2x + 3y = 8$

      ii   outline three interpretations that could be made from the graph in (c) (i)

                        (6 marks)

    d)   State four units used during storage of data in computer storage media with their

        respective equivalent in bytes   (2 marks)

    e)   Solve the following set of equations using elimination method

$$2x - 3y = 2$$

$$5x + 4y = 6$$ (4 marks)

3.   a)   Outline four properties of the normal distribution curve   (4 marks)

    b)   A certain metal manufacturer combines three types of metal to produce metal alloys

        to be used in road construction. the metal alloys are produced in different quantities

        measured in kgs as shown below.

	Type	of	metal	(kg)
Weight of alloys (tonnes)	P		H	V
200	100		3490	0.2150
220	140		3541	0.2340
240	190		3615	0.2453

Construct a linear interpolation table showing the amount in kg of metal p,h and v

required to produce each of the following tonnes of alloys

      i.   210

      ii.   225   (8 marks)

c) Differentiate between mutually exclusive events and independent events as applied in probability (2 marks)

d) Table 2 shows frequency distribution of weight in kg of 160 students in a certain college. use it to answer questions below

Weight	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85
Frequency	12	15	21	26	37	22	16	5	1

Calculate each of the following measures about the weight of the students

i. Mean

ii. Interquartile range (6 marks)

4. a) describe each of the following types of charts using a sketch in each case

i. Simple Bar Graph

ii. Histogram (6 marks)

b) The actual length of a road is 500 metres. A measuring instrument was used to measure the length and the readings showed the length to be 510 metres. Using this example, Differentiate between relative error and absolute error (6 marks)

c) Plot the graph of the, equation x^2-3x-10=0 for $-5 \leq x \leq 7$, hence solve the equation x^2-3x-10=8. (4 marks)

d) Differentiate between categorical data and numerical data as used in statistics

(4 marks)

5. a) Describe the term range as applied in statistics (1 mark)

b) Explain three properties of standard deviation as a measure of dispersion. (6 marks)

c) Using matrix method ,solve the following set of simultaneous equations

$2x - 3y + 4z = 2$

$5x + 4y + z = 33$

$3x + 5y + z = 31$ (9 marks)

d) Define the terms as used in statistics:

i. Median

ii. Mean Deviation

iii. Skewness

iv. Kurtosis (4 marks)

6. a) Distinguish between a finite set and an infinite set as used in set theory, giving an example in each case. (2 marks)

b) A straight line passes through points(5,12) and (9,15).determine the value of y along the line where x=7 (4 marks)

c) A certain casino club uses three different coloured tokens for playing games for ksh 2000 one can purchase any of the following combinations of tokens,14 gold,20 silver and 24 bronze,or 20 gold, 15 silver and 19 bronze,or 30 gold, 5 silver and 13 bronze.

    i. illustrate the narrative as a system of simultaneous equation; (2 marks)

    ii. determine the cost of one token for each of the three colours, using Cramer's rule. (8 marks)

d) Using completing square method solve the quadratic equation $2x^2+9x-5=0$.(4 marks)

7 a) Evaluate each of the following expressions:

    i. $^6p_3$

    ii. $^8c_5$ (4 marks)

b) A golf club contains of 26 members of whom 12 are female. determine the number of ways in which a 3-member committee comprising 1 male and 2 female can be formed (4 marks)

c) Using matrix method solve the following set of linear equations:

$x_1+2x_2+x_3=4$

$3x_1-4x_2-2x_3=2$

$5x_1+3x_2+5x_3=-1$ (8 marks)

d) State four properties of the arithmetic mean. (4 marks)

8 a) Using binomial expansion, expand $(x + y)^8$ in ascending powers of y up to the fifth term (4 marks)

b) Machakos university presented two teams for the national games; the men's hockey team and ladies handball team. The probability of men's team hockey team winning is 3/5 while that of la dies team winning is 4/7.using tree diagram, determine the probability that:

    i. at least one team wins; (4 marks)

    ii. both teams lose (4 marks)

c) Using elimination method, solve the following system of simultaneous equations (8 marks)