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

CERTIFICATE IN INFORMATION COMMUNICATION TECHNOLOGY

1920/104: MATHEMATICS

DATE: 15/12/2020 **TIME: 8.30-11.30 AM**

INSTRUCTIONS

1. Explain the following as applied in probability
   a) Mutually exclusive events
   b) Random variables (4 marks)
2. Convert each of the following number systems to their respective equivalents, showing your working.
   a) 475_8 to binary
   b) $7B2D_{16}$ to denary (4 marks)
3. With the aid of examples in each case distinguish between lower triangular matrix and identity matrix (4 marks)
4. Using the graphical method, solve the quadratic equation $y=2x^2-12x+16$, for $0 \leq x \leq 5$. (4 marks)
5. a) Using binomial theorem, expand the expression $(2+x)^4$ in ascending powers of x, simplifying the results (2 marks)
   b) Using Pascal's triangle, determine the coefficients of the expression $(a+b)^4$ (3 marks)

6 a) determine the equation of the line passing through point (18,6) and has a gradient of -12 (2 marks)

b) The size of matrix X is a 5 by 3 matrix and the product of XY is a matrix of size 5 by 7 matrix. Determine the size of matrix Y. (3 marks)

7. a) The ages of 6 students in a class are:

17,15,18,21,14,19

Determine the median age (2 marks)

b) Given the following matrix:

$B=\begin{pmatrix}5 & 2\\ 3 & -4\end{pmatrix}$

Determine the value of B^{-1} (2 marks)

8 a) the probability that Tom and Mary will pass in an interview is 0.4 and 0.5 respectively. Determine the probability that both will fail in the interview (2 marks)

c) solve the following inequality

$(5x+5)/-10 \leq 2x-1$ (2 marks)

9 a) In a class of 100 students ,45 study history,53 study English and 15 study both subjects. Using Venn diagram determine the number of students who study neither English nor history. (4 marks)

10. Outline two advantages of range as measure of dispersion (2 marks)

Given the matrix

$A=\begin{pmatrix}3 & 4\\ -2 & 1\end{pmatrix}$

Determine $(A^T)^{-1}$ (2 marks)

11. a) In a particular cybercafé, the probability of one of the computers to fail to operate is 0.15. if 5 computers are selected at random, using tree diagram determine the probabilities that:

i. 2 computers will fail to operate

ii. less than 3 computers will fail to operate

iii. 4 computers will operate

iv. at least 1 of the computers will fail to operate (9 marks)

b) Explain the meaning of the following as used in set theory:

i. universal set

ii. subset

iii. empty set (6 marks)

12. a) The following is a distribution table of profits of companies in the same industry

Profit(ksh 000's)	Number of companies
0-10	5
10-20	15
20-30	40
30-40	20
40-50	16
50-60	4

Calculate the:

i. Mean

ii. Median

iii. Standard deviation

iv. Pearson's coefficient of skewness (9 marks)

b) Explain three properties of a normal distribution curve (6 marks)

13. a) Solve the following simultaneous equations using matrix method

$8x + 12y + 4z = 368$

$4x + 10y + 4z = 264$

$10x + 4y - 2z = 216$ (6 marks)

b) A survey of 210 jobs applicants was carried out to determine whether they were competent in three languages: French, Spanish and Japanese. The following were the results:

. 10 were competent in all the three languages

. 18 were competent in both Japanese and French

. 22 were competent in Japanese and Spanish

. 48 were competent in Spanish and French

. 104 were competent in French

. 126 were competent in Spanish

. 50 were competent in Japanese

i. Present the information above in a venn diagram

ii. Determine the number of applicants that were competent in:

I. Spanish but not French

II. Japanese but not French

III. Neither Spanish not French

IV. Spanish or French

V. Both French and Spanish but not Japanese (9 marks)

14. a) A shop sold three types of products; A, B and C on a certain day as follows:

2 units of A,3 units of B and 1 unit of C for ksh 490.

3 units of A,4 units of B and 2 units of C for ksh 700

1 unit of A, 2 units of B and 1 unit of C for ksh 330

i. Formulate simultaneous equations to represent the information above

ii. Using elimination method determine

I. Price per unit of each of the three products;

II. Total amount to be paid for 4 units of A and 2 units of B (9 marks)

b) Explain three challenges that an organization may encounter from the use of computers in its operations (6 marks)

15. a) Using relevant examples define the following as applied in matrix

i. Diagonal matrix

ii. Singular matrix

iii. Identity matrix

iv. Null matrix

v. Singular matrix

vi. Unit matrix (6 marks)

b) A group of 6 boys has a mean weight of 54 kg. when 2 more boys joined the group, one with x kg and the other with $(x + 10)$ kg, the new mean is 55kg.determine the value of x (6 marks)

c) A committee of three people is to be selected from a group of eight people. Determine the number of possible ways of forming the committee. (3 marks)