INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - APRIL 2025

PROGRAMME: BIT
YEAR/SEM: YEAR 1/SEMESTER 2
COURSE CODE: BIT1203
NAME: MATHEMATICS FOR IT

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Attempt all (40 Marks, Write the correct alternative in the booklet provided)

Question 1:

1. What will be the probability of getting odd numbers if a dice is thrown? (02 Marks)

   A) ½

   B) 1/6

   C) 3

   D) 1

2. The probability of getting two tails when two coins are tossed is - (02 Marks)

   A) 1/4

   B) 1/2

   C) 1/6

   D) 1/3

3. What will be the probability of losing a game if the winning probability is 0.3? (02 Marks)

   A) 0.7

   B) 0.5

   C) 0.3

   D) 0.6

4. Which of the following can be the probability of an event?

   (02 Marks)

   A) -0.5

   B) 007

C) 488/489

D) 4/3

5. A matrix having one row and many columns is known as? (02 Marks)

A) Column matrix

B) Identity matrix

C) Row matrix

D) Diagonal matrix

6. Consider the following five relations on the set $A = \{1, 2, 3, 4,5\}$: $R1 = \{(1, 1), (1, 2), (2, 3), (1, 3), (4, 4)\}$ $R2 = \{(1, 1)(1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$, $R3 = \{(1, 3), (2, 1)\}$ and $R4 = A \times A$, determine which of the relations are reflexive.

(02 Marks)

A) R1 and R2

B) R3 and R4

C) R1 and R4

D) None

7. The function f is invertible if and only if

(02 Marks)

A) *f* is onto.

B) *f* is one-to-one and not onto.

C) *f* is both one-to-many and onto.

D) *f* is both one-to-one and onto.

8. A compound proposition that is always _____ is called a tautology. (02 Marks)

A) False

B) True

9. The composition function of f and g is written as fog

(02 Marks)

A) True

B) False

10. Consider the following five relations on the set $A = \{1, 2, 3, 4\}$: $R1 = \{(1, 1), (1, 2), (2, 3), (1, 3), (4, 4)\}$ $R2 = \{(1, 1),(1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$, $R3 = \{(1, 3), (2, 1)\}$ and $R4 = A \times A$, the universal relation. Determine which of the relations are symmetric.

(02 Marks)

A) R4 and R2

B) R1 and R3

C) R3 and R4

D) R1 and R4

11. Amatrix having many rows and one column is known as? (02 Marks)

A) Column matrix

B) Identity matrix

C) Row matrix

d) Diagonal matrix

12. The *domain* of a relation R is the set of all second elements of the ordered pairs which belong to R.

(02 Marks)

A) True

B) False

13. Find the cardinal number of the set: $A = \{a, b, c, . . . , y, z\}$

(02 Marks)

A) 5

B) 26

C) 25

D) 27

14. The integer value of -3.5 is given by

(02 Marks)

A) -3.5

B) -3.

C) -4

D) -2

15. Which of the following statement is a proposition? (02 Marks)

A) Kampala is Somalia

B) God bless you!

C) What is the time now?

D) I can

16. The proposition Kampala is in Uganda or Nairobi is in Congo is (02 Marks)

A) True

B) False

17. A _____ is an ordered collection of objects. (02 Marks)

A) Relation

B) Function

C) Proposition

D) Set

18. The union of the sets A={1, 2, 5} and B={1, 2, 5,6} is the set _____ (02 Marks)

A) {1, 2, 6, 1}

B) {1,2,5}

C) {1, 2, 1, 2}

D) {5}

19. The intersection of the sets A={1, 2, 5} and B={1, 2, 5, 6} is the set _____ (02 Marks)

A) {1, 2}

B) {5, 6}

C) B

D) A

20. The set O of odd positive integers less than 10 can be expressed by (02 Marks)

A) {1, 2,3,4,5,6,7,8, 9}

B) {3,5,7,9}

C) {1, 2, 5, 9}

D) {1, 3, 5, 7, 9}

Question 2:

1. What will be the value of P(not E) if P(E) = 0.07? (02 Marks)

A) 0.93

B) 0.07

C) 0

D) 1

2. Given the sample space S={1,2,3,...,10}, what is the probability of obtaining an even number? (02 Marks)

A) 1/5

B) 1/2

C) 2/3

D) 1/10

3. If X and Y are mutually exclusive events, the probability of X or Y is given by

(02 Marks)

A) P(X or Y)= P(X)-P(Y)

B) P(X or Y)= P(X)*P(Y)

C) P(X or Y)= P(X)+P(Y)

D) P(X or Y)= 0

4. Events A and B are such that P(A)=19/30, P(B)=2/5 and P(A or B)=4/5. Find P(A and B).

(02 Marks)

A) P(A and B)= 38/150

B) P(A and B)= 7/30

C) P(A and B)=1/2

D) P(A and B)=4/5

5. If set A = {1, 2, 3} and set B = {3, 4, 5}, what is A and B?

(02 Marks)

A) {1, 2, 3, 4, 5}

B) {3}

C) {1,2}

D) {4, 5}

6. If set A = {1, 2, 3} and set B = {3, 4, 5}, what is A or B?

(02 Marks)

A) {3}

B) {1, 2,3,4,5}

C) {1, 2, 3}

D) {4, 5}

7. What is the complement of the set A = {apple, banana, orange}?

(02 Marks)

A) {apple, banana, orange}

B) Universal set

C) {grape, peach, mango}

D) { }

8. If A = {1, 2, 3} and B = {3, 4, 5}, what is A-B (A subtract B)?

(02 Marks)

A) {1, 2, 3, 4, 5}

B) {3}

C) {4,5}

D) {1,2}

9. If set A = {1, 2, 3} and set B = {2, 3, 4}, what is A n (A U B)?

(02 Marks)

A) {1, 2, 3}

B) {2, 3}

C) {1, 2, 3, 4}

D) {2, 3, 4}

10. What is the order of the matrix below? (02 Marks)

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$$

A) 3X2

B) 2X3

C) 2X2

D) 3X3

11. Which of the following relations on the set {1,2,3,4} is reflexive?

(02 Marks)

A) {(1,1),(2,2),(3,3)}
B) {(1,2),(2,3),(3,4)}
C) {(1,1),(1,2),(2,1),(2,2),(3,3),(4,4)}
D) {(1,2),(2,1),(3,4),(4,3)}

12. Which of the following relations on {a,b,c} is transitive?

(02 Marks)

A) {(a,a),(b,b),(c,c),(a,b),(b,c)}
B) {(a,b),(b,c),(c,a)}
C) {(a,b),(b,c),(c,b)}
D) {(a,a),(b,b),(c,c),(a,b),(b,a),(b,c),(a,c)}

13. Let (02 Marks)

$A = \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 5 & 2 \\ 1 & 3 \end{pmatrix}$. What is $A \cdot B$?

A) $\begin{pmatrix} 12 & 7 \\ 19 & 14 \end{pmatrix}$

B) $\begin{pmatrix} 7 & 12 \\ 14 & 19 \end{pmatrix}$

C) $\begin{pmatrix} 9 & 4 \\ 14 & 11 \end{pmatrix}$

D) $\begin{pmatrix} 7 & 9 \\ 12 & 14 \end{pmatrix}$

14. Which of the following relations on {1,2,3} is both symmetric and antisymmetric?

(02 Marks)

A) {(1,1),(2,2),(3,3),(1,2),(2,1)}
B) {(1,1),(2,2),(3,3)}
C) {(1,1),(2,2),(3,3),(1,2),(2,1),(2,3)}
D) {(1,1),(2,2),(3,3),(1,2),(2,1),(3,2)}

15. What is the negation of the statement: "It is not sunny, and it is not raining"?

(02 Marks)

A) It is sunny or it is raining

B) It is sunny or it is not raining

C) It is sunny and it is raining

D) It is not sunny or it is raining

16. Floor (1.999) + Ceil(2.988) is equal to _____ (02 Marks)

A) 1
B) 6

C) 5
D) 4

17. If f(x)=3x-2, what is $f^{-1}(x)$ (02 Marks)

A) $\frac{x+2}{3}$
B) $\frac{x-2}{3}$
C) $3x + 2$
D) $\frac{2-x}{3}$

18. In how many ways can 3 books be arranged on a shelf?

(02 Marks)

A) 3
B) 6
C) 9
D) 27

19. In how many ways can a committee of 3 people be selected from a group of 7 people?

(02 Marks)

A) 7
B) 21
C) 35
D) 42

20. How many different ways can the letters in the word "ALGORITHM" be arranged?

(02 Marks)

A) 10!

B) 10!/2!

C) 10!/(2!x3!)

D) 10!/(2!x2!)

SECTION B

Attempt any four (Each question carries 15 marks, 60 Marks)

Question 1:

A bag contains 5 red balls and 3 green balls. A ball is drawn at random and then replaced. Another ball is drawn. What is the probability that

(a) both balls are green?

(05 Marks)

(b) both balls have the same colour?

(05 Marks)

(c) the balls are of different colours? (05 Marks)

Question 2:

Consider the conditional proposition $p \rightarrow q$. The simple propositions $q \rightarrow p$, $\neg p \rightarrow \neg q$ and $\neg q \rightarrow \neg p$ are called, respectively, the *converse*, *inverse*, and *contrapositive* of the conditional $p \rightarrow q$. Which if any of these propositions are logically equivalent to $p \rightarrow q$?

(15 Marks)

Question 3:

Use crammer's rule to solve the following system of linear equations: (15 Marks)

x+3y+2z=9

2x-3y+z=-3

3x+y-2z=-13

Question 4:

Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Let R be the following relation from A to B:

$R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$

(*a*) Determine the matrix of the relation. (04 Marks)

(*b*) Draw the arrow diagram of *R*.

(04 Marks)

(*c*) Find the inverse relation of *R*.

(03 Marks)

(*d*) Determine the domain and range of *R*. (04 Marks)

Question 5:

Find the number *m* of ways that 7 people can arrange themselves:

(*a*) In a row of chairs; (04 Marks)

(*b*) Around a circular table. (04 Marks)

(c) Find *n* if $P(n, 2) = 72$.

(03 Marks)

(d) Find the number of combinations of 4 objects, *A*, *B*, *C*, *D*, taken 3 at a time.

(04 Marks)

Question 6:

(a) Use matrix inversion to solve the following pair of simultaneous equations (15 Marks)

$$-3x + y = -3$$
$$4x + 7y = 29$$

(b)

$$\text{Find } AB \text{ where } A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 0 & -4 \\ 5 & -2 & 6 \end{bmatrix}.$$

Question 7:

(a) Let U= {1,2 , ..., 9} be the universal set, and let A = {1, 2, 3, 4, 5}, C = {5, 6, 7, 8, 9}, E = {2, 4, 6, 8}, B = {4, 5, 6, 7}, D = {1, 3, 5, 7, 9}, F = {1, 5,9}.

Find:

(i) A U B and A n B (04 Marks)

(ii) A U C and A n C

(04 Marks)

(iii) D U F and D n F (04 Marks)

(b) During the course of one week 132 people visited a health spa of whom

75 had a herbal bath but no massage, 28 had a massage but no herbal bath and

15 had both. How many had neither?

(03 Marks)

Question 8:

Find the number m of ways that 10 people can arrange themselves:

(a) In a row of chairs,

(04 Marks)

(b) Around a circular table.

(04 Marks)

(c) Find n if $P(n, 2) = 72$.

(03 Marks)

(d) Find the number of combinations of 4 objects, A, B, C, D, taken 4 at a time.

(04 Marks)

Question 9:

In a container, there are 4 blue marbles and 2 yellow marbles. One marble is randomly drawn and then replaced. Another marble is drawn. Determine the probability that:

(a) Both marbles drawn are yellow

(04 Marks)

(b) The marbles drawn are of different colors

(04 Marks)

(c) The second marble drawn is blue given that the first marble drawn was yellow.

(03 Marks)

(d) At least one of the marbles drawn is blue. (04 Marks)

Question 10:

Consider the universal set U = {10, 20, 30, ..., 80, 90} and sets A = {10, 20, 50, 60}, B = {20, 50, 70}, C={10,30,50,70,90}. Find: (15 Marks)

(a) $A \cap B$

(b) $A \cup B$

(c) $A \oplus B$

(d) $A \oplus C$

(e) $(B \oplus C) \backslash A$

(f) $(A \cup C) \backslash B$

Question 11:

Use crammer's rule to solve the following system of linear equations: (15 Marks)

$$2x - y + 3z = 4$$
$$x + 2y - z = 1$$
$$3x + 4y + 2z = 11$$

Question 12:

Use matrix inversion to solve the following pair of simultaneous equations (06 Marks)

$$\begin{cases} 2x + 3y = 7 \\ 4x - 2y = 2 \end{cases}$$

(b) Consider the following matrices (06 Marks)

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \quad \text{and} \quad B = \begin{pmatrix} 7 & 8 \\ 9 & 10 \\ 11 & 12 \end{pmatrix}$$

Perform the product AB.