UNIRAZAK
UNIVERSITI TUN ABDUL RAZAK

FINAL EXAMINATION

JULY 2023

COURSE TITLE **DISCRETE MATHEMATICS**

COURSE CODE **RCIT1813**

DATE/DAY **16 OCTOBER 2023 / MONDAY**

TIME/DURATION **09:00 AM - 11:00 AM / 02 Hour(s) 00 Minute(s)**

INSTRUCTIONS TO CANDIDATES :

1. Please read the instruction under each section carefully.
2. Candidates are reminded not to bring into examination hall/room any form of written materials or electronic gadget except for stationery that is permitted by the Invigilator.
3. Students who are caught breaching the Examination Rules and Regulation will be charged with an academic dishonesty and if found guilty of the offence, the maximum penalty is expulsion from the University.

(This Question Paper consists of **9** Printed Pages including front page)

*****DO NOT OPEN THE QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO*****

This question paper contains TWO (2) sections. Please answer ALL questions in the answer booklet provided. **[100 MARKS]**

SECTION A **(60 Marks)**

There are THIRTY (30) questions this part of the examination paper. Answer ALL questions in the answer booklet.

1. A tautology in logic statements is a formula which is always _____ .

   A. false
   B. true
   C. null
   D. a contradiction.

2. Which of the following is a subset of set {1, 2, 3, 4,5,6.9.12}?

   A. {1, 2}
   B. {1, 2, 3}
   C. {1}
   D. All of the above mentioned.

3. The symbol "→" represent in logical operator _____ .

   A. XOR – Exclusive or
   B. AND
   C. IMPLICATION
   D. NEGATION

4. Which compound statement represent the propositional logic P → Q based on the statement below?
   P : This book is interesting , Q : I am staying at home

   A. This book is interesting and I am staying at home.
   B. This book is interesting, or I am staying at home.
   C. Either this book is interesting, or I am staying at home, but not both
   D. If this book is interesting, then I am staying at home.

5. Which option contains two equal sets?

   A. X = {7, 6} and Y = {6}
   B. X = {6, 7, 8, 9} and Y = {8, 7, 9, 6}
   C. X = {6,7, 9} and Y = {7, 6}
   D. X = {7, 6} and Y = {7, 6, 3}

6. In which of this set, the number 49 is NOT an element?

A. {x ∈ R | x is an integer less than 42}
B. {x ∈ R | x is the square of an integer}
C. {x ∈ R | x is an odd number greater than 1}
D. {3,{3}, 13, 23, 33,49}

7. What is the cardinality of each of the set {a, {a},b, c}.

A. 0
B. 1
C. 4
D. 5

8. The intersection of the sets {1, 2, 8, 9, 10, 5} and {1, 2, 6, 10, 12, 15} is the set_____.

A. {1, 2, 10}
B. {5, 6, 12, 15}
C. {2, 5, 10, 9}
D. {1, 6, 12, 9, 8}

9. Which option is the negation of the bits "1011011"?

A. 11011011
B. 0100100
C. 0110100
D. 1100100

Question 10 to 12 refers to the scenario and Venn diagram below:
The diagrams below represent the activities chosen by youth club members. They can choose to play tennis (T), badminton (B) or squash (S).

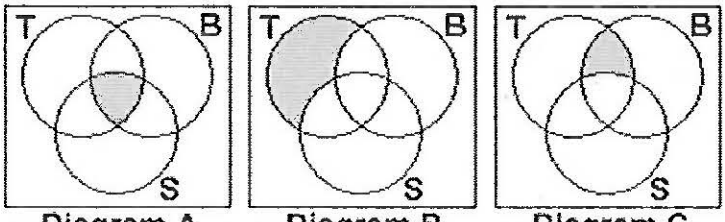


Diagram A Diagram B Diagram C

10. Which diagram represents students that play all 3 sports.

A. A
B. B
C. C
D. None of the above

11. Which diagram represents those who play tennis and badminton, but not squash?

A. A
B. B
C. C
D. None of the above

12. Which diagram represents those who play only tennis.

A. A
B. B
C. C
D. None of the above

13. If A = {4, 7, 10, 13, 16, 19, 22} B = {5, 9, 13, 17, 20} C = {3, 5, 7, 9, 11, 13, 15, 17} D = {6,11, 16, 21} then find A - C

A. { 4,7,10}
B. {4, 7, 10, 13, 16, 19, 22}
C. {4,10,16,19,22}
D. None of the above

14. How do we translate following English sentences into logical formulas:
Let p ="I major in CS",
q = "I will find a good job",
r = "I can program".

Sentence : I will not find a good job unless I major in CS or I can program.

A. $p \vee q \vee r$
B. $p \vee r$
C. $(\neg p \vee \neg r) \rightarrow \neg q$
D. $(\neg p \wedge \neg r) \rightarrow \neg q$

15. How many elements are there in the Power set of set A= {Φ, {Φ},0, {0}}?

A. 4 elements
B. 6 elements
C. 8 elements
D.16 elements

16. For the sequence 1,7,25,79,241,727,.....formula for $\{a_n\}$ is _____.

A. $3^{n+1} - 2$
B. $3^n - 1$
C. $(-3)^n + 4$
D. $n^2 - 2$

17. What is the arithmetic formula to calculate the nth term (a_n) of an arithmetic sequence?

A. $a_n = a_1 + (n - 1)d$
B. $a_n = a_1 * (n - 1)d$
C. $a_n = a_1 * n$
D. $a_n = a_1 + n/d$

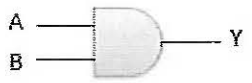
18. Find a_{11} given that the first few terms of an arithmetic sequence are given by 7,14,21,...

A. 55
B. 77
C. 90
D. 100

19. In the given arithmetic series find the number of terms (elements).
5, 8, 11, 14, 17, 20.....50.

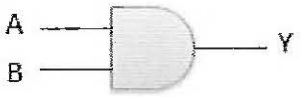
A. 11
B. 13
C. 15
D. 16

20. Identify the logic gate in the diagram below.



A. OR
B. AND
C. XOR
D. NAND

21. Identify the truth table for the logic gate below:



A.

Inputs		Output
A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1

B.

Inputs	Output
A	B
0	1
1	0

C.

Inputs		Output
A	B	AB
0	0	0
0	1	0
1	0	0
1	1	1

D. None of the tables

22. Which of the following is a collection of graphs?

A. Row and columns
B. Vertices and edges
C. Equation
D. Set Logic

23. Another name for the directed graph is _____ .

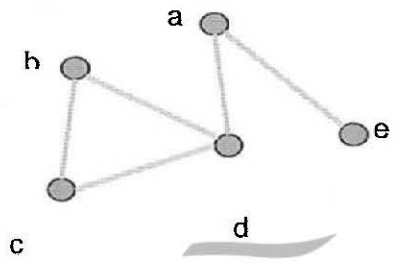
A. Direct graph
B. Digraph
C. Dir-graph
D. Digraph

24. A terminal node in a binary tree is called _____ .

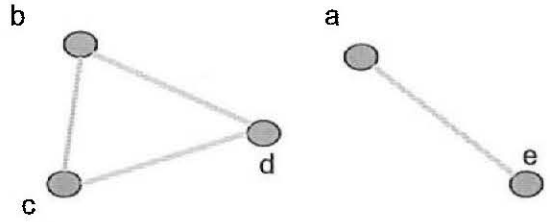
A. Root
B. Leaf
C. Child
D. Branch

25. Which of the following is NOT a connected graph?

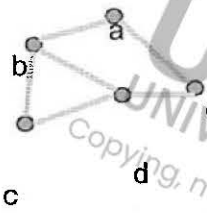
A.



B.



C.

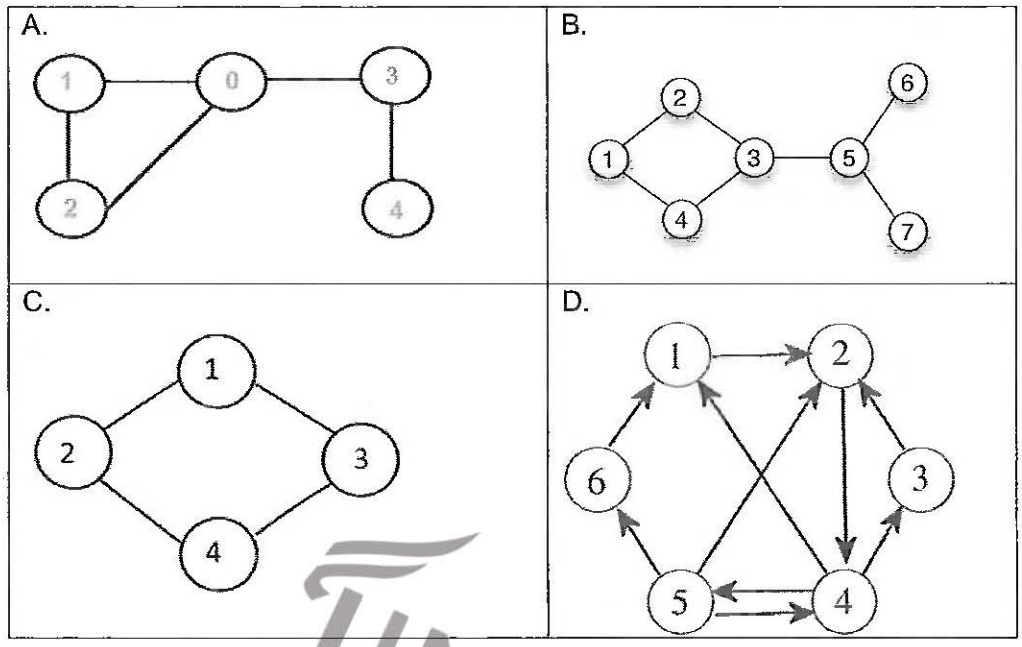


D. None of the diagrams

26. In a directed graph, G = (V, E) consists of a set V of vertices and a set E of _____ .

A. elements
B. vertices
C. edges
D. epsilon

27. Which diagram below represents a directed graph?



28. What is a tree in graph theory?

A. A graph with cycles
B. A graph with multiple connected components
C. A connected graph with no cycles
D. A graph with only one vertex

29. In a full binary tree with height 3 (including the root), how many leaf nodes are there?

A. 4
B. 8
C. 16
D. 6

30. What is the minimum number of edges in a connected graph with 7 vertices and no cycles?

A. 5
B. 6
C. 7
D. 8

SECTION B **(40 Marks)**

There are TWO (2) questions in this part of the examination paper. Answer ALL question in the answer booklet.

QUESTION 1 (20 Marks)

The first term of an arithmetic sequence is 7, and the common difference (d) is -2. Find the sum of the first 15 terms of the sequence.

QUESTION 2 (20 Marks)

Draw a Venn diagram representing three groups A, B and C where $A \cup (B \cap C)$

***** END OF QUESTION PAPER *****