



## EXAMINATION PAPER

FACULTY : COMPUTER SCIENCE AND MULTIMEDIA  
COURSE : BACHELOR (Hons) OF INFORMATION TECHNOLOGY (BIT)  
YEAR/ SEMESTER : FIRST YEAR / SEMESTER ONE  
MODULE TITLE : DISCRETE MATHEMATICS  
CODE : BIT 114  
DATE : 28 APRIL, 2019, SUNDAY  
TIME ALLOWED : 3 HOURS  
START : 1:00 PM FINISH : 4:00 PM

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### **Instruction to candidates**

1. This question paper has THREE (3) Sections.
2. Answer **ALL** questions in Section A, MCQ.
3. Answer **5** questions in Section B, MSAQ.
4. Answer **2** questions in Section C, MEQ.
5. No scripts or answer sheets are to be taken out of the Examination Hall.
6. For Section A, answer in the OMR form provided.

***Do not open this question paper until instructed***

## SECTION A

### Multiple Choice Questions

(30\*1=30)

1. **The determinant of any triangular matrix is:**
  - a. Sum of its main diagonal elements
  - b. Product of main diagonal elements
  - c. Half of sum of its main diagonal elements
  - d. No relation with diagonal elements
2. **If we have p variable, then the truth table has \_\_\_\_\_ rows.**
  - a.  $2+p$
  - b.  $2^p$
  - c.  $2p$
  - d.  $2^p-1$
3. **If a determinant has any of its two rows identical, then its value is always:**
  - a. One
  - b. Zero
  - c. Imaginary number
  - d. None
4. **Every positive integer is also \_\_\_\_\_ number.**
  - a. Natural
  - b. Rational
  - c. Irrational
  - d. Whole
5. **Cartesian product of two sets A and B is:**
  - a.  $A \cap B$
  - b.  $A \times B$
  - c.  $A \geq B$
  - d.  $A \leq B$
6. **If a tree has 16 vertices, it consists \_\_\_\_\_ edge.**
  - a. 15
  - b. 16
  - c. 17
  - d. 18
7. **The vertex with degree one is \_\_\_\_\_ vertex.**
  - a. Pendant
  - b. Unit
  - c. Null
  - d. Isolated

8. The collection of \_\_\_\_\_ is called graph.
- Equations
  - Row and columns
  - Vertex and edges
  - None of the above
9. Which of the following is the negation of the '4 is even and today is Friday'?
- 4 is even and today is not Friday.
  - 4 is not even and today is Friday.
  - 4 is even or today is Friday.
  - 4 is not even or today is not Friday.
10. A vertex with no children is called:
- Siblings
  - Leaf
  - Ancestor
  - Root
11. The children of same parent node are:
- Siblings
  - Leaf
  - Ancestor
  - Root
12. A matrix whose all elements above the main diagonal are zero, called:
- Upper triangular
  - Lower triangular
  - Both 'a' and 'b'
  - None of the above
13. Let A is  $p \times q$  ordered matrix and B is  $q \times r$  ordered matrix, then order of  $A \times B$  is:
- $n \times n$
  - $p \times r$
  - $m \times n$
  - $r \times n$
14. A number consisting only digit 0 to 7 is \_\_\_\_\_ number.
- Binary
  - Octal
  - Decimal
  - Hexadecimal

**15. Suppose p: You have to be good; q: you have to be honest. A sentence you have to be good and honest can be logically written as:**

- a.  $p \rightarrow q$
- b.  $q \rightarrow p$
- c.  $p \wedge q$
- d.  $q \cap p$

**16. To solve the recurrence relation of order k, we need \_\_\_\_\_ number of initial condition.**

- a.  $K-1$
- b.  $k$
- c.  $k+1$
- d.  $2k$

**17. An equation whose variables are of power at most 2 is \_\_\_\_\_ equation.**

- a. Bi quadratic
- b. Cubic
- c. Quadratic
- d. Linear

**18. Rank of a matrix of order  $5 \times 4$  is at most:**

- a. 2
- b. 3
- c. 4
- d. 5

**19. A system of equations is inconsistent if it has \_\_\_\_\_ solution.**

- a. One
- b. Many
- c. Both 'a' and 'b'
- d. None of the above

**20. If  $x^2 - 1 = 0$  then  $x =$**

- a. 0, 1
- b. 0, -1
- c. 1, -1
- d. 1

**21. Let A is  $m \times n$  and B is  $p \times q$  ordered matrix. Then BA is possible when:**

- a.  $n=p$
- b.  $m=p$
- c.  $m=q$
- d.  $m=n$

**22. Let p: You do more work, q: You earn sufficient money. Then ‘If you do more work, then you will earn sufficient money.’ can be written as:**

- a.  $p \wedge q$
- b.  $p \vee q$
- c.  $p \rightarrow q$
- d.  $q \rightarrow p$

**23. If A is a set containing 5 elements, what is the cardinality of power set of A?**

- a. 8
- b. 12
- c. 32
- d. 40

**24. If  $A = \{a, b, c, d\}$ ,  $B = \{c, d, e\}$ . Then  $A \cap B$  is:**

- a.  $\{a\}$
- b.  $\{a, b\}$
- c.  $\{c, d\}$
- d.  $\{a, b, c\}$

**25. Which condition is required for a square matrix to be skewing symmetric?**

- a.  $A^2 = I$
- b.  $A^2 = 0$
- c.  $A^T = -A$
- d.  $A^2 = A$

**26. What is the order of the matrix  $A \times B$  if A is  $m \times n$  and B is  $n \times r$  ordered matrix?**

- a.  $m + r$
- b.  $m - r$
- c.  $m r$
- d.  $m \div r$

**27. A number 0 is:**

- a. Positive integer
- b. Negative integer
- c. Neutral integer
- d. Not an integer

**28. The matrix formed by the relation of vertices and edges of graph is \_\_\_\_\_ Matrix.**

- a. Adjacent
- b. Incident
- c. Unit
- d. Null

**29. If a system has more number of variables than number of equations, then it has \_\_\_\_\_ Solution.**

- a. One
- b. Many
- c. Both 'a' and 'b'
- d. None of the above

**30. If a characteristic equation is of degree k, then it has at most \_\_\_\_\_ root.**

- a.  $k/2$
- b. k
- c. 3
- d.  $2k$

## **SECTION B**

### **Short Answer Questions**

**Attempt any five (5) questions out of eight (8) questions (5\*6=30)**

**1. Define mathematical induction. Prove the following statement using mathematical induction**

$$2+4+6+\dots+2n = n(n+1)$$

**2. State and prove DeMorgan's Theorem with truth tables.**

**3. Define contradiction and tautology. Show that the compound proposition  $[p \wedge (p \rightarrow q)] \rightarrow q$  is tautology. (2+4) ( unit 3: Introduction to modelling)**

**4. Define the terms: wheels, cycle and complete graph.**

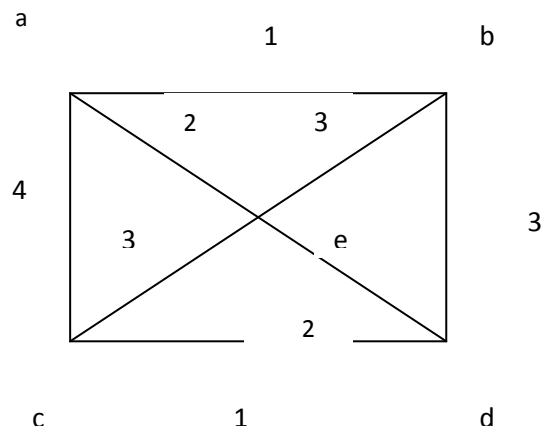
**5. Define fallacy. Explain different forms of fallacy. (1+5)**

**6. Write short notes on the following:**

- a. Recurrence Relation**
- b. Transport Network**

**7. Define adjacency and incidence matrix with suitable example. (3+3) ( unit 7: Graphs, functions and inequalities)**

8. Use Kruskal's Algorithm to find the minimum spanning tree to find the weighted graph.



### SECTION C

#### Long Answer Questions

Attempt any two (2) questions out of three (3) questions (2\*20=40)

1. Define symmetric, asymmetric, reflexive, irreflexive transitive and non-transitive properties of a relation. Let  $A = \mathbb{Z}$ , the set of integers and Let  $R = \{(a,b) \mid A \times B \mid a < b\}$ . Verify if  $R$  is an equivalence relation or not? (10+10)

2.

- a. Prove the following (3\*5=15)

- I.  $[(A \rightarrow B) \wedge A] \rightarrow B$  is a tautology.
- II.  $(A \vee B) \wedge [(\neg A) \wedge (\neg B)]$  is a contradiction.
- III.  $(A \vee B) \wedge (\neg A)$  is a contingency.

- b. Explain any five connectives of propositional logic with truth tables. (5)

3. Define homogeneous recurrence relation. Solve the recurrence relation. (2+6+6+6) (unit 8: Simultaneous equations)

- a.  $a_n = 6a_{n-1} - 8a_{n-2}$  for  $n \geq 2$ ,  $a_0 = 4$ ,  $a_1 = 10$
- b.  $a_n = 2a_{n-1} - a_{n-2}$  for  $n \geq 2$ ,  $a_0 = 4$ ,  $a_1 = 1$
- c.  $f_n = 3f_{n-1} - 3f_{n-2} + f_{n-3}$  for  $n \geq 2$ ,  $f_0 = 1$ ,  $f_1 = 2$ ,  $f_2 = 3$

\*\*\*\*\*BEST OF LUCK\*\*\*\*\*