

Code No. : 20424 E Sub. Code : CACA 21

B.C.A. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2022.

Second Semester

Computer Application – Allied

MATHEMATICAL FOUNDATION FOR COMPUTER  
SCIENCE

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- If  $a = \{1, 2, 3\}$ , then the number of subsets in the power set of A is  
(a) 6 (b) 8  
(c) 9 (d) 27
- Let  $A = \{2, 3, 5, 7, 11\}$ . The cardinality of A is  
(a) 4 (b) 11  
(c) 2 (d) 5

- Maximum no. of edges in a simple undirected graph with  $n$  vertices is \_\_\_\_\_.

- (a)  $\frac{n}{2}$  (b)  $\frac{n(n-1)}{2}$   
(c)  $\frac{n(n+1)}{2}$  (d)  $\frac{n-1}{2}$

- Nodes with atleast one child is known as \_\_\_\_\_.

- (a) Leaf node (b) Internal nodes  
(c) Child node (d) Siblings

- Every vertex of G connected with every other vertex of G is known as \_\_\_\_\_.

- (a) Null graph (b) Complete graph  
(c) Multi graph (d) Pseudo graph

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).  
Each answer should not exceed 250 words.

- (a) List all the members of the power set of each of the following sets.

(i)  $A = \{1, 2, 3\}$

(ii)  $B = \{\{a\}, \{b\}\}$

Or

- A function is to be \_\_\_\_\_ if every element  $b \in B$ , there is an element  $a \in A$  with  $f(a) = b$ .  
(a) One to one (b) One to many  
(c) Onto (d) Bijection
- If  $f : A \rightarrow B$  is a bijective function then  $f \circ f^{-1} =$  \_\_\_\_\_.  
(a)  $I_A$  (b) A  
(c)  $I_B$  (d) B
- A \_\_\_\_\_ is a declarative sentence that is either true or false.  
(a) Value (b) Domain  
(c) Co-domain (d) Proposition
- Which of the following is not a proposition?  
(a) Where are you going?  
(b)  $2+3=5$   
(c) Today is Saturday  
(d) Mona drives the car
- An edge which starts from a vertex and moves back to it is called \_\_\_\_\_.  
(a) Isolated (b) Pendent  
(c) Loop (d) Parallel

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- Investigate the Relation  $R = \{(1,1)(2,2)(1,3)(3,1)\}$  is equivalence relation for  $A = \{1, 2, 3\}$ .

- (a) Test the function  $f(x) = x+1$  for one to one and onto.

Or

- If  $f = \{(a,b)(b,a)(c,c)\}$ . Find  $f^3$ .

- (a) Show that  $p \leftrightarrow q$  and  $(p \rightarrow q) \wedge (q \rightarrow p)$  are logically equivalent?

Or

- (b) Construct the truth table for  $(p \wedge q) \vee (p \wedge r)$ .

- (a) Define indegree and out degree.

Or

- (b) Draw a complete graph with five vertices.

- (a) Define paths and cycles.

Or

- (b) Draw the subgraph  $G - a$  for G:



PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)  
Each answer should not exceed 600 words.

16. (a) Prove that the total number of all possible subsets of a given set containing  $n$  elements is  $2^n$ .

Or

- (b) Let  $z$  denote the set of integers and the relation  $R$  in  $z$  defined by  $aRb$  iff  $a - b$  is even integer. Then show that  $R$  is an equivalence relation.
17. (a) Let  $f: A \rightarrow B$  and  $g: B \rightarrow C$  be two functions. Prove that if both  $f$  and  $g$  are injective then  $g \circ f$  is injective.

Or

- (b) Let  $f$  and  $g$  be the functions from the set of integers defined by  $f(x) = 2x + 3$  and  $g(x) = 3x + 2$ . Determine the  $f \circ g$  and  $g \circ f$ .
18. (a) Let  $p$ : Babu is rich

$q$ : Babu is happy. write a simple verbal

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Sentence for the following statement.

(i)  $p \leftrightarrow \sim q$

(ii)  $\sim p \rightarrow q$

(iii)  $pv \sim q$

(iv)  $q \rightarrow p$

Or

- (b) Using truth table, prove that  $PV(q \wedge r) = (p \vee q) \wedge (p \vee r)$ .

19. (a) Show that the maximum no. of edges in a simple undirected graph with  $n$  vertices is  $\frac{n(n-1)}{2}$ .

Or

- (b) Explain the following graphs with example.
- (i) Un directed graph
- (ii) Multi graph
- (iii) Bipartite graph
- (iv) Null graph

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20. (a) Write detail note on the Binary tree.

Or

- (b) Discuss about any two operation on graphs.