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Reg. No. : .....

Code No. : SS 30547 E **Sub. Code : JACA 21/ SACA 21**

B.C.A. (CBCS) DEGREE (Special Supplementary) EXAMINATION, APRIL 2020.

Second Semester

Computer Application – Allied

MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A set is a well defined collection of ————————

(a) Objects (b) Structures

(c) Classes (d) Variables

2. Two sets A and B are mutually exclusive if

(a) $A \cup B$=null (b) $A - B$=null

(c) $A \cap B$=null (d) $B - A$=null

3. One-to-one function is also called as ————————

(a) Subjection (b) Bijection

(c) Unijection (d) Injection

4. A function $f:x \to y$ is a bijection iff there exists ———————— function

(a) unique (b) special

(c) inverse (d) constant

5. The truth value of '$m \vee n$' is false only if

(a) m is false (b) n is false

(c) m and n are false (d) none

6. $p \vee (\neg\, p \wedge Q) \Leftrightarrow$

(a) $p \wedge Q$ (b) $p \vee Q$

(c) Both (a) and (b) (d) None

7. A vertex in a graph is also called as ————————

(a) line (b) edge

(c) node (d) weight

8. A graph which can have both multiple edges and loops is called as ————————

(a) multigraph (b) complete graph

(c) undirected graph (d) pseudgraph

9. In a graph G, every ———————— contains a path

(a) vertex (b) walk

(c) node (d) loop

10. The number of pendent vertices is a binary tree is ————————

(a) $(n+1)/2$ (b) 2^n

(c) $2n$ (d) $n(n+1)/2$

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Compute $A-B, B-A$ and $(A-B)\cup(B-A)$ given, $A=\{1,3,4,5,7,9\}$ and $B=\{1,2,4,6,7,8\}$.

Or

(b) If the number of elements in the sets $A,B,C, B\cap C$ are a,b,c,d respectively, find the number of elements in $(A\times B)\cup(A\times C)$.

12. (a) Let $A=R-\{3\}$ and $B=R-\{1\}$. Consider the function $f:A\to B$ define by $f(x)=(x-z)/(x-3)$. Is 'f' one-one and onto? Justify your answer.

Or

(b) Show that $f:R\to R$ defined by $f(x)=x+5$ is bijection. Also find f^{-1}.

13. (a) Construct the truth table for the statement formula $p\wedge\neg Q$.

Or

(b) Construct the truth table to show that $(p\to Q)\leftrightarrow(\neg Q\to\neg p)$ is a tautology.

14. (a) Define

(i) a graph

(ii) subgraph

Or

(b) Define

(i) simple graph

(ii) weighted graph

15. (a) Prove that in a Graph G, every walk $u-v$ contains a path $u-v$.

Or

(b) Differentiate between undirected graph and directed graph.

PART C — ($5 \times 8 = 40$ marks)

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

16. (a) For any three sets A,B,C prove the following DeMorgon's Laws.

(i) $A-(B \cup C)=(A-B) \cap (A-C)$

(ii) $A-(B \cap C)=(A-B) \cup (A-C)$

Or

(b) Among the middle age men who read newspaper, 72% read English newspaper and 86% read Tamil newspaper. Find the percentage of middle age men who read both.

17. (a) Let A be the set of first three natural numbers A function is defined as $f:A \to N$ by $f(x)=x^2+\perp$. Find

(i) domain of f,

(ii) range of f

(iii) co-domain of f

(iv) $f(3)$

(v) pre-images of 2 and 4.

Or

(b) Consider function f and g such that composite gof is defined and is one-one. Find

(i) Are f and g both necessarily one-one?

(ii) Are f and g both necessarily onto, if gof is onto?

18. (a) Construct truth table for the statement formula $(p \vee Q) \vee (\neg p \wedge Q) \vee (P A \neg Q) \vee (\neg p \wedge \neg Q)$.

Or

(b) Show that $p \rightarrow (Q \rightarrow R) \Leftrightarrow p \rightarrow (\neg Q \vee R) \Leftrightarrow (p \wedge Q) \rightarrow R$.

19. (a) The maximum number of edges among all n vertex graphs with no triangles is $\lfloor n^2/4 \rfloor$. Prove it.

Or

(b) Let $G_1(n_1, e_1)$ and $a_2(n_2, e_2)$ be two disjoint graphs. Prove that

(i) $G_1 U G_2$ is a $(n_1 + n_2,\ e_1 + e_2)$ graph

(ii) $G_1 \times G_2$ is a $(n_1 n_2, n_1 e_2 + n_2 e_1)$ graph.

20. (a) Describe walk and path with respect to Graph connectively.

Or

(b) Prove the following properties of the Binary tree

(i) The number of vertices 'n' in a binary tree is odd

(ii) The number of pendant vertices in a binary tree is $(n+1)/2$.

———————