Reg. No. :

Code No. : 6388

Sub. Code : PCSM 13/ ZCSM 13

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2021

First Semester

Computer Science — Core

MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — $(10 \times 1 = 10 \text{ marks})$

Answer ALL questions.

Choose the correct answer:

- 1. When is the conjunction of P and Q true?
 - (a) Both P and Q are false
 - (b) P is true, Q is false
 - (c) P is false, Q is true
 - $(d) \quad Both \ P \ and \ Q \ are \ True$

(6 pages)

2. Which of the following is equivalent to $-(P \land Q)$?

	(a)	$\neg \neg (P \land Q)$	(b)	$\neg (P \lor Q)$	
	(c)	$\neg P \lor \neg Q$	(d)	$\neg P \land \neg Q$	
3.	When are two sets A and B disjoint?				
	(a)	$A \cap B = \phi$	(b)	$A \subset B$	
	(c)	$A \cap B \neq \phi$	(d)	$A \subseteq B$	
4.	Wha	$\operatorname{at} \operatorname{is} A \cup (A \cap B)?$			
	(a)	A	(b)	$A \cap B$	
	(c)	В	(d)	$A\cup B$	
5.	If A is a null matrix, then what is p(A)?				
	(a)	1	(b)	0	
	(c)	∞	(d)	not defined	
6.	For Ax = has	a system of non-ho = <i>B</i> , if Rank(<i>A</i>) ≠ 1 Solu	moger Rank(/ tion.	neous linear equations A, <i>B</i>) then the system	
	(a)	unique	(b)	infinite	
	(c)	finite	(d)	no	
7.	For poss	n people, where sible seating arrang	<i>n</i> is rement	odd, the number of t is	

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

Page 2 Code No. : 6388

- 8. A closed walk in which no vertex (except the initial and the final vertex) appears more than once is called _____.
 - (a) loop (b) ring
 - (c) circuit (d) path
- 9. The number of vertices in a binary tree is always
 - (a) prime(b) composite(c) even(d) odd
- 10. The row with all zeros in an incidence matrix represents ______ Vertex.
 - (a) isolated (b) isomorphic
 - (c) connected (d) Euler

PART B — $(5 \times 5 = 25 \text{ marks})$

Answer ALL questions, choosing either (a) or (b).

11. (a) Show that
$$(x)(H(x) \to M(x)) \land H(s) \Rightarrow M(s)$$
.

Or

- (b) Show that $S \lor R$ is tautologically implied by $(P \lor Q) \land (P \to R) \land (Q \to R)$.
- 12. (a) Show that for any two sets $A (A \cap B) = A B$.

Or

Page 3 **Code No. : 6388**

(b) Let $X = \{1, 2, 3, 4\}$ and $R = \{(1,1), (1,4), (4,1), (4,4), (2,2), (2,3), (3,2), (3,3)\}$. Write the matrix of R and sketch its graph.

13. (a) Find the rank of the matrix
$$\begin{pmatrix} 2 & 1 & 3 \\ 1 & 0 & 2 \end{pmatrix}$$
.

(b) Find the Eigen values of A^5 when $A = \begin{bmatrix} 3 & 0 & 0 \\ 5 & 4 & 0 \\ 3 & 6 & 1 \end{bmatrix}$.

14. (a) Prove that the number of vertices of odd degree in a graph is always even.

Or

- (b) Write a note on Travelling Salesman problem.
- 15. (a) Mention any five properties of trees.

Or

(b) Compare Kruskal and Prim's algorithms.

[P.T.O.]

Page 4 **Code No. : 6388**

PART C — $(5 \times 8 = 40 \text{ marks})$

Answer ALL questions choosing either (a) or (b).

16. (a) Show that $(x)(P(x)\vee Q(x))\Rightarrow (x)P(x)\vee (\exists x)Q(x)$ by indirect method.

Or

- (b) Obtain the principle disjunctive normal form.
 - (i) $\neg P \lor Q$

(ii)
$$(P \land Q) \lor (\neg P \land R) \lor (Q \land R)$$

17. (a) Show that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ using Venn diagram.

\mathbf{Or}

- (b) Draw the flowchart for factorial function.
- 18. (a) Show that the equations x + y + z = 6, x + 2y - 2z = -3, 2x + 3y + z = 11 are consistent and solve.

Or

Page 5 **Code No. : 6388**

(b) Find the Eigen value and Eigen vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

19. (a) Explain any two applications of graph.

Or

- (b) What are the different operations on graph?
- 20. (a) Draw all the trees of four labelled vertices.

Or

(b) What is an adjacency matrix? Explain.

Page 6 **Code No. : 6388**