

ADCA / MCA (II Yr)
Term-End Examination
June, 2007

CS-07 (S) : DISCRETE MATHEMATICS

Time : 3 hours

Maximum Marks : 75

Note : Question no. 1 is **compulsory**. Answer any **three** questions from the rest.

1. (a) Determine the truth value for each of the following statements : 3
- (i) $4 + 3 = 6$ AND $3 + 3 = 6$
- (ii) $5 + 3 = 8$ OR $3 + 1 = 5$
- (b) Represent the graph
- $$G = \{ (1, 2, 3, 4), e_{xy} : |x - y| \leq 1 \}$$
- where e_{xy} is an edge connecting vertices x and y . 3
- (c) Let G be a non directed graph with 12 edges. If G has 6 vertices each of degree 3 and the rest have degree less than 3, what is the minimum number of vertices G can have ? 3

(d) Consider the following relation on

$\{1, 2, 3, 4, 5, 6\}$.

$$R = \{(i, j) \mid |i - j| = 2\}$$

Is R transitive ?

Is R reflexive ?

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(e) Write inverse, converse, contrapositive for

$$[p \wedge (p \rightarrow q)] \rightarrow q$$

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(f) Calculate $-25 + 75$ using 2's complement.

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(g) Let $A = \{x \in \mathbb{R} : x \neq 1\}$ and define $f(x) = \frac{2x}{x-1}$.

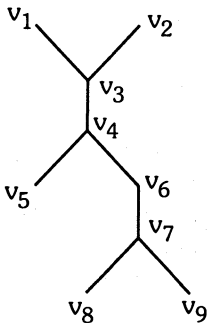
f is bijective function with Range of f as the

set $B = \{y \in \mathbb{R} : y \neq 2\}$. Find $f^{-1}(y)$.

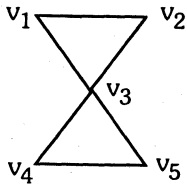
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(h) Find diameter of tree T

3



(i) Consider the graph



Does the graph have Eulerian circuit ?

If Yes, write Eulerian circuit.

If No, justify.

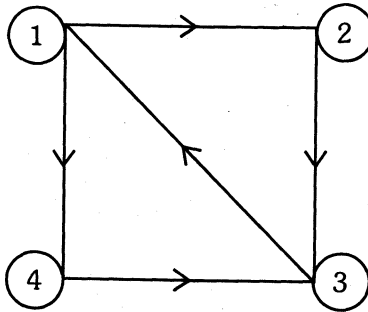
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(j) Show that every distributive lattice is modular.

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2. (a) Is the directed graph given below strongly connected ?

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(b) Prove the validity of the following argument, "If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy. I will not be happy. Therefore, either I will not get the job or I will not work hard."

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(c) Function $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by

$$f(x) = x^2$$

Is this function one-one? Justify.

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3. (a) Out of 250 candidates who failed in an examination, it was revealed that 128 failed in Maths, 87 in Physics and 134 in aggregate. 31 failed in Maths and in Physics, 54 failed in aggregate and in Maths, 30 failed in aggregate and in Physics. Find how many candidates failed

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(i) in all three subjects.

(ii) in Maths but not in Physics.

(iii) in aggregate but not in Maths.

(b) Obtain PDF form for

$$\neg p \vee q$$

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(c) Draw switching circuit for

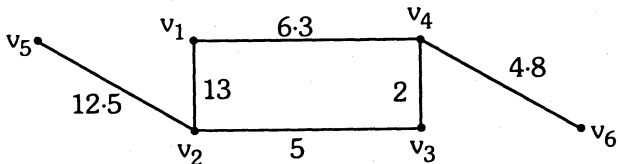
$$(x_1 + x_2)x_3 + x_4$$

2

(d) Give an example of complete Bipartite graph.

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4. (a) Find Minimum Spanning Tree using Prim's Algorithm for



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- (b) Let $X = \{51, 52, 53, 54\}$ be the universe, of which the following are two fuzzy sets :

$$A = \frac{0.2}{51} + \frac{0.5}{52} + \frac{0.8}{53} + \frac{1}{54}$$

$$B = \frac{1}{51} + \frac{0.8}{52} + \frac{0.5}{53} + \frac{0.2}{54}$$

Find $A \cup B$, $A \cap B$.

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- (c) If $f : \mathbb{R} \rightarrow \mathbb{R}$, $g : \mathbb{R} \rightarrow \mathbb{R}$ are defined by

$$f(x) = x + 2 \quad \forall x \in \mathbb{R}$$

$$g(x) = x^2 \quad \forall x \in \mathbb{R}$$

Find $(f \circ g)(x)$ and $(g \circ f)(x)$.

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- (d) Let $A = \{1, 3, 9, 27, 81\}$. Draw Hasse diagram of poset $(A, 1)$.

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5. (a) Using Karnaugh map, simplify

$$X' = A'BC'D' + ABC'D' + A'BCD' + ABCD'$$

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- (b) If R is an equivalence relation on set A , prove that R^{-1} is also an equivalence relation.

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- (c) Apply Dijkstra's algorithm to find shortest path from a to f .

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