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Reg. No. : .....

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JASE 11

B.Sc. (CBCS) DEGREE EXAMINATION,  
APRIL 2018.

First Semester

Computer Science/Software Engineering – Allied

DISCRETE MATHEMATICS

(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. If  $(a, a) \in R$  for all  $a \in n$  then the relation is called as

- (a) transitive
- (b) symmetric
- (c) reflexive
- (d) none of these

A relation which is reflexive, anti symmetric and transitive called \_\_\_\_\_ relation

- (a) Equivalence
- (b) Partial order
- (c) Inverse
- (d) Binary

The other name for one-to-one function is \_\_\_\_\_

- (a) surjective
- (b) bijective
- (c) injective
- (d) none of these

$f \circ g(x) = ?$

- (a)  $g(f(x))$
- (b)  $f(g(x))$
- (c)  $f(f(x))$
- (d) all of these

The following operator is called as conjunction

- (a)  $\wedge$
- (b)  $\vee$
- (c)  $\sim$
- (d) none of these

If  $p = T$  and  $q = F$  then  $p \vee q = ?$

- (a)  $F$
- (b)  $T$
- (c)  $T$  or  $F$
- (d) none of these

All the elements of matrix is zero then it is called as \_\_\_\_\_

- (a) identity
- (b) null
- (c) column
- (d) row

8. A square matrix is said to be skew-symmetric if  $A^T = ?$ .

- (a)  $A$  (b)  $A^T$   
(c)  $(A^T)^T$  (d)  $A^{-1}$

9. The number of odd degree vertices in a graph is always \_\_\_\_\_

- (a) odd (b) even  
(c) 100 (d) none of these

10. A tree is a \_\_\_\_\_ graph

- (a) cyclic (b) acyclic  
(c) self (d) none of these

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words

11. (a) Discuss in detail Inverse of relation

Or

(b) What is relation? Explain with example

(a) Show that the function  $f(x) = x^3$  and  $g(x) = x^{1/3}$  for all  $x \in R$  are inverse of each other.

Or

(b) Write in detail about functions with neat diagrams.

(a) What is condition statement? Explain with example.

Or

(b) Find the CNF of the following:

- (i)  $p \wedge (p \Rightarrow q)$   
(ii)  $(q \vee (p \wedge r)) \wedge \sim ((p \vee r) \wedge q)$ .

(a) Find the transpose matrix for

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 0 \\ 1 & 1 & 2 & 4 & 3 \\ 5 & 3 & 1 & 7 & 8 \end{pmatrix}.$$

Or

(b) Prove that  $(A^*)^* = A$ , where  $A$  is conjugate transpose matrix.

15. (a) Write in detail about types of graphs.

Or

(b) Prove that a simple graph with  $n$  vertices contains at least two vertices of degree  $\leq n-2$ .

PART C — ( $5 \times 8 = 40$  marks)

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

Each answer should not exceed 600 words.

16. (a) Write in details about Inverse of relation.

Or

(b) How to represent a relation in matrix format? Explain.

17. (a) Explain the following:

(i) One-to-one

(ii) Onto

(iii) Bijective functions.

Or

(b) Suppose  $f : A \rightarrow B$  is a bijective function.

$f^{-1}$  is its inverse, for each  $x \in A$

$$f \circ f^{-1}(x) = x \quad f^{-1} \circ f(x) = x,$$

$$f \cdot f^{-1} = I_B \text{ and } f^{-1} \circ f = I_A.$$

- (a) Determine the DNF of

$$p \Rightarrow ((p \Rightarrow q) \wedge (\sim q \vee \sim p)).$$

Or

- (b) Show that  $p \Leftrightarrow q$  and  $(p \Rightarrow q) \wedge (q \Rightarrow p)$  are equivalent.

- (a) Show that  $A^T = A$ , where  $A$  is symmetric matrix.

Or

- (b) Prove that  $A^3 - 4A^2 - 3A + 11I = 0$  where

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix} \text{ and } I \text{ in unit matrix.}$$

- (a) Explain the following:

- (i) Direct
- (ii) Undirect
- (iii) Weighted graphs.

Or

- (b) Discuss in detail about Binary trees.
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