LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.C.A. DEGREE EXAMINATION – **COMPUTER APPLICATIONS**

FIRST SEMESTER – NOVEMBER 2016

CA 1804 - DISCRETE STRUCTURES

Date: 02-11-2016 Dept. No. Max. : 100 Marks
Time: 09:00-12:00

PART A

Answer ALL Questions (10 X 2 = 20 Marks)

1. What is tautology?
2. Give Truth Table for **pvq**
3. Let A = {0, 1, 2 } Relation R on A is defined by R = { (0,0), (1,1), (2,2)}. Is it reflexive?
4. When a poset will have maximal element?
5. Define function.
6. State pigeonhole principle.
7. What is adjacent vertex in a graph?
8. What is the degree of a vertex?
9. Define monoid.
10. What is an Abelian group?

PART B

Answer ALL Questions (5 X 8 = 40 Marks)

11a. Construct truth table and verify p v (q v r) = (p v q) v r

(or)

11b. Construct truth table and verify (p → r) ∧ (q → r) ≡ (p v q) → r

12a. Determine whether the following functions are one-to-one, onto, one-to-one onto
i. f:Z → Z defined by $f(x) = x^2 + 5x + 8$ ii. f: Z → Z defined by f(x) = x + 5

(or)

12b. If X = {-2, 0, 1 }, Y = { -1, 1, 2, 4 } and Z = { 2, 4, 5, 7 } f: X → Y is defined by f(x) = x + 1 g:Y → Z is defined by g(y) = y + 3 then find **gof and fog.**

13a. Find the number of integers between I and 50 (both inclusive) that are not divisible by any of the integers 2,3,and 5

(or)

13b. From a club consisting of 6 men and 3 women, a committee of 6 persons have to be formed. In how many ways can we select a Committee of
i. 4 men and 2 women ii. at least one women iii. at most one man iv. 3 men and 3 women.

14a. Define the following with suitable examples
i Hamiltonian graph ii. Bipartite graph iii. Planar graph iv. Complete graph.

(or)

14b. What is adjacency matrix? Give adjacency matrix for
i. rectangle having two diagonals ii. triangle

15a. Define semigroup. .
If * is a binary operation on the set R of real numbers defined by a*b = a + b + 2ab then verify that (R, *) is a semigroup. Check whether it is commutative.

(or)

15b. Define group
If S={1,2,3,6} and * is defined by a*b= lcm(a,b). Show that (S,*) is a monoid. What is identity element of S under *?

PART C

Answer any TWO Questions (2 x 20 = 40 Marks)

16a. i. State the laws of Proposition.

ii Verify distributive law using truth table

16b. i. Give procedure to draw Hasse diagram

ii. Let A = { 1, 2, 3, 4, 6, 12 } and R is defined by aRb if a exactly divides b. Draw Hasse diagram for R and find the greatest and least elements.

17a. There are 300 students in a college studying Science, Arts, and Commerce discipline who are from different states speaking different languages. Of these 165 are speaking Tamil, 122 speaking Telugu and 93 speaking Malayalam. Further 65 can speak both Tamil and Telugu. 44 can speak Tamil and Malayalam and 21 can take Malayalam and Telugu. If 12 of these students can speak all the three languages, then how many of these 300 students can not speak in any of these three languages.

17b. Write Dijkstra algorithm for finding shortest path between any two vertices.

18a. i. If (G, *) is abelian group show that $(a * b)^n = a^n * b^n$

ii. Show that (E, +) is a subgroup of (Z, +), where E is set of even integers and Z is set of integers

18b. If * is defined on R such that $a * b = a + b - ab$ for a, b $\in$ R, show that (R, *) is an abelian group.

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