LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – NOVEMBER 2016

16PCA1MC01 - DISCRETE STRUCTURES

Date: 02-11-2016 Dept. No. Max. : 100 Marks
Time: 01:00-04:00

PART A

Answer ALL Questions (10 X 2 = 20 Marks)

1. Define proposition in mathematical logic
2. Write the truth table of $p \leftrightarrow q$.
3. Define the following relations: i. Reflexive ii. Symmetric iii. Transitive.
4. What is greatest lower bound and least upper bound of a poset?
5. When a function is said to be one -to- one onto?
6. Define permutations and combinations.
7. Define graph. How tree is different from graph?.
8. A connected graph contains Eular circuit iff ___of its vertices is of __ degree.
9. Define semigroup?
10. When a group is cyclic group?

PART B

Answer ALL Questions (5 X 8 = 40 Marks)

11a. Construct truth table for the following compound proposition**:**

$$(p \vee q) \wedge (\neg p \vee r) \rightarrow (q \wedge r)$$

(or)

11b**.** Without using truth table, prove the following:

$$(\neg p \vee q) \wedge (p \wedge (p \wedge q)) \equiv p \wedge q$$

12a. Which of the following relations on A = { 0, 1, 2, 3 } are equivalence relations?
i. R = { (0,0), (1,1), (1,2), (2,1), (2,2), (3,3) } ii. R = { (0,0), (0,2), (2,0), (2,2), (2,3), (3,2), (3,3)}

(or)

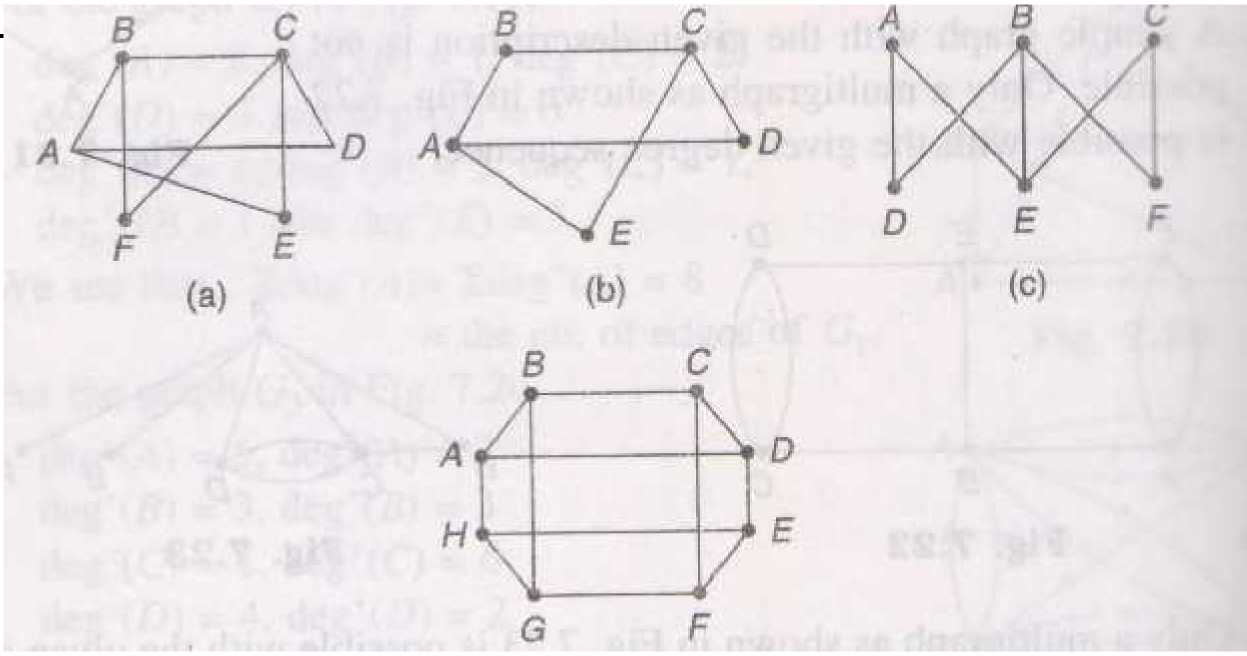
12b. Prove that If $f:X \rightarrow Y$ and $g:Y \rightarrow Z$ are functions then $gof:X \rightarrow Z$ is an injection, surjection or bijection according as f and g are injections, surjections or bijections.

13a. In how many ways can 20 students out of a class of 30 be selected for an extra-curricular activity if
i. Rama refuses to be selected ii. Johnson insists on being selected
iii. Raja and Antony insists on being selected

(or)

13b. Find the number of integers between I and 100 (both inclusive) that are not divisible by any of the integers 2,3,and 5.

14a. Determine which of the following graphs are bipartite and which are not. If a graph is bipartite, state if it is completely bipartite



(or)

14b. Define the following:
i. Hamiltonian graph ii. Euler graph iii. Complete graph iv. Connected graph

15a. Show that the group (G, $+_5$) is a cyclic group where G = {0, 1, 2, 3, 4 }. What are its generators?

(or)

15b. If * is defined on R such that a*b = a + b – ab for a, b ϵ R, show that (R,*) is an abelian group.

PART C

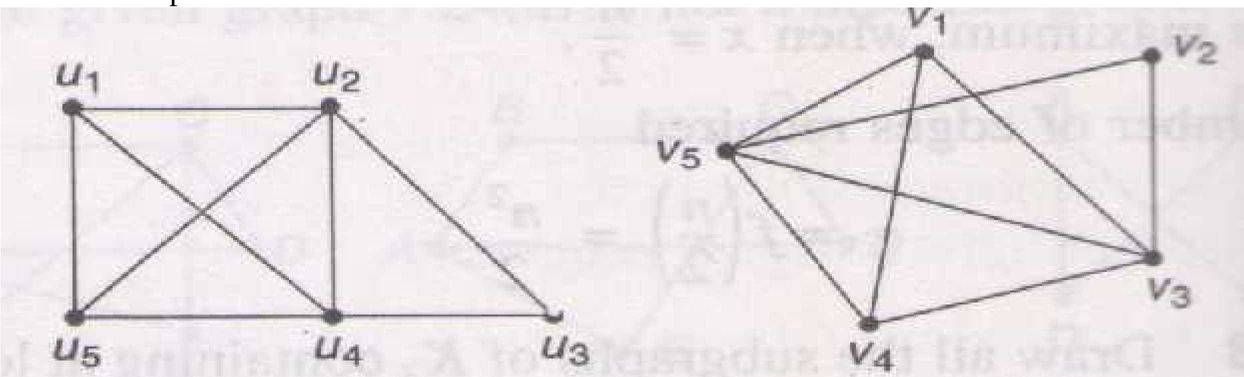
Answer any TWO Questions (2 x 20 = 40 Marks)

16a. Constructing the truth table, find the principal disjunctive normal form and principal conjuctive normal form of the following $(p \wedge q) \vee (\neg p \wedge q) \vee (q \wedge r)$

16b. If f:X → Y and g:Y → Z are invertible functions then gof : X → Z is also invertible and $(g o f)^{-1} = f^{-1} o\, g^{-1}$

17a. State and prove Principle of Inclusion-Exclusion.

17b. Define graph isomorphism. Determine whether the following pairs of graphs are isomorphic.



18a i. Show that the set {1, 2, 3, 4 } is not a group under addition modulo 5.
ii. . Show that the set Q^+ (set of positive rational numbers) forms an abelian group under the * operation which is defined by a*b = ab/2 where a, b ϵ Q^+. .

18b. Prove that the necessary and sufficient condition for a non-empty subset H of a group(G,*) to be a sub group is a,b, Ɛ H => ab^{-1} Ɛ H

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