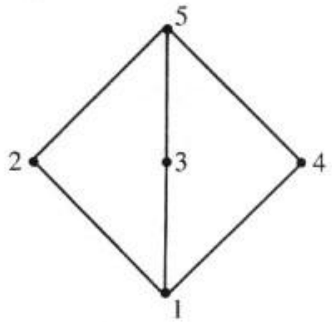
Or

State Euler's formula for a planar graph. Give an example of a planar graph with 5 vertices and 5 regions and venty Euler's formula for your example.

5. a) Let $L = \{1, 2, 3, 4, 5\}$ be the lattice shown below. Find all sub lattices with three or more elements.



b) Write down the binomial theorem.

c) Draw hasse diagram for the "less than or equal to" relation on set A={0, 2, 5, 10, 11, 15}

d) Determine the particular solution of the recurrence relation $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2$

Or

Explain briefly:-

i) Posets

ii) Permutation

iii) Combination

iv) Total solutions

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Roll No ....

CS/IT - 302

B.E. III Semester

Examination, December 2015

Discrete Structure

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) If $A = \{1, 4\}$, $B = \{4, 5\}$, $C = \{5, 7\}$, determine

i) $(A\times B)\cup(A\times C)$

ii) $(A\times B)\cap(A\times C)$

b) Let $A = \{2, 3, 4\}$ and $B = \{3, 4, 5, 6, 7\}$. Assume a relation R from A to B such that $(x, y)\in R$ when a divides 6. Determine R, its domain and range.

c) Briefly explain the application of Pigeon hole principle using an example.

d) Show by mathematical induction:

$$1^2 + 3^2 + 5^2 + \dots\dots + (2n-1)^2 = \frac{n(2n+1)(2n-1)}{3}$$

Or

Let f: R → R be defined by

$$f(x)=\begin{cases}2x+1, & x\le 0\\ x^2+1, & x>0\end{cases}$$

Let g: R → R be defined by

$$g(x)=\begin{cases}3x-7, & x\le 0\\ x^3, & x>0\end{cases}$$

then find the composition gof

2. a) Define semi group. Write its properties.

   b) Write short note:

   i) Monoid

   ii) Normal subgroup

   c) Prove that every subgroup of a cyclic group G is cyclic.

   d) Prove that the set $G' = \{0, 1, 2, 3, 4, 5\}$ is a finite abelian group of order 6 with respect to addition module 6.

Or

Let (R, +, X) be a ring. The operation $\overset{*}{\otimes}$ is defined by $a \otimes b = a \times b + b \times a$. Show that (R, +, X) is a commutative ring.

3. a) Prove by truth table that the following is tautology-

   $(P \leftrightarrow q \wedge r) \Rightarrow (\sim r \rightarrow \sim p)$

   b) Obtain the principal disjunctive normal form of the following formula:-

   $\sim (p \vee q) \leftrightarrow (p \wedge q)$

   c) Investigate the validity of the following argument

$$\begin{array}{l} p \rightarrow r \\ \sim p \rightarrow q \\ q \rightarrow s \\ \hline \therefore \sim r \rightarrow s \end{array}$$

   d) Design DFA and NDFA accepting all strings over {0, 1}, which end in 0 but do not contain 11 as substring.

Or

Prove the validity of the following argument:

"If Ram is selected in IAS examination, then he will not be able to go to London. Since Ram is going to London, he will not be selected in IAS examination."

4. a) Prove that, in a graph total number of odd degree vertices is even but then number of even degree vertices may be odd.

   b) Distinguish between k-coloring of a graph and chromatic number of a graph.

   c) Define Euler and Hamiltonian graph with example.

   d) Find minimum distance between two vertices K and L of graph, using Dijkstra's algorithm.