**Unit -V**

5. a) Define posets and lattices.

   b) Define Eulerian and Hamiltonian paths.

   c) How many variable names of 8 letters can be formed from the letters a, b, c, d, e, f, g, i and h if no letter is repeated.

   d) Solve the difference equation:

   $$a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 .$$

   Or

   Explain binomial theorem in detail.

   ******

Roll No .................................

# CS/IT - 302

## B.E. III Semester

Examination, June 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.

### Unit -I

1. a) Explain Countable and Uncountable sets with example.

   b) Let A and B any two subsets of universal set U, then

   $(A \cup B)' = A' \cap B'$.

   c) If R is a relation on the set of integers such that $(a,b) \in R$ if and only if '3a + 4b = 7n' or some integer n. Prove that R is an equivalence relation.

   d) By principle of mathematical induction prove that $7^{2n} + 2^{3n-3}3^{n-1}$ is divisible by 25.

   Or

   Let function $f$ and $g$ defined by f(x) = 2x+1, and $g(x) = x^2 - 2$ respectively.
   Find:

   i) (gof)(4)

   ii) (fog)(4)

iii) (gof)(a+2)
iv) (fog)(a+2)
v) fof (some, times denoted by $t^2$)
vi) (gog)

## Unit -II

2. a) Define Ring.
   b) Explain Abelian group.
   c) Show that a semigroup with more than one idempotent element cannot be a group.
   d) If R is the additive group of real numbers and $R_+$ the multiplicative group of positive real numbers, prove that the mapping $f: R \to R_+$ defined by $f(x) = e^x$ for all $x \in R$ is an isomorphism of R onto $R_+$.

   **Or**

   Is the set of integers, I = {......,–3,–2,–1,0, 1, 2, 3........} a group for the binary operation defined as $a*b = a - b$ for all $a , b \in I$?

## Unit -III

3. a) "If 4x–2=10 then x = 3". Find converse, inverse and contrapositive.
   b) Explain one - place and n - place predicate with example.
   c) Prove that: $(P \vee Q) \cap \neg Q \to P$ is a logical implication.
   d) Explain the following terms and also give examples to explain them:
      i) Quantifier
      ii) Universal quantifier
      iii) Existential quantifier
      iv) Negation of a quantifier
      v) Normal form
      vi) Tautology.

**Or**

Minimize the following automata machine given below. With initial state S0 and final state S3.

| State | Input | |
|-------|---|---|
|       | 0 | 1 |
| S0 | S1 | S0 |
| S1 | S0 | S2 |
| S2 | S3 | S1 |
| S3 | S3 | S0 |
| S4 | S2 | S5 |
| S5 | S6 | S4 |
| S6 | S5 | S6 |
| S7 | S6 | S3 |

## Unit -IV

4. a) Define Isomorphic graph.
   b) Explain Eulerian paths and circuits.
   c) Explain adjacency and incidence matrix to represent graph.
   d) Apply Dijkstra algorithm to find the shortest path from vertex P to Q in graph shown in fig.
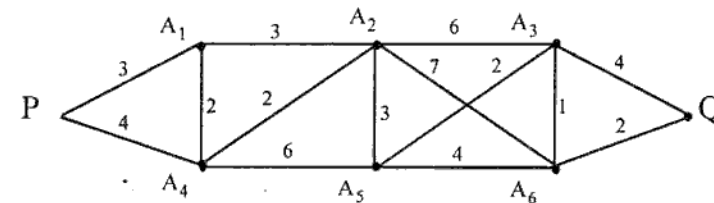


**Or**

Explain minimum spanning tree with their applications. Also give algorithm to find minimum spanning tree of a weighted graph.