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Name: ....

Reg.No. ....

FIFTH SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2010

IT 04 505 – GRAPH THEORY AND COMBINATORICS

Time: 3 Hours Maximum: 100 Marks

Answer all questions

1. (a) State and prove Euler's formula for planar graphs.
   (b) Compare Kruskal's and Prim's algorithms for minimal spanning tree.
   (c) State the max-flow min-cut theorem.
   (d) Using generating functions, compute
   $1^2+2^2+3^2+4^2+.....+n^2$
   (e) Define a path, walk and cycles in graph.
   (f) Write the Bellman Ford algorithm.
   (g) How many 5 letter words can be formed from the word PARIPASSU?
   (h) Find the generating function of 1!, 2!, 3!, ...

$(8\times 5=40)$

2. (a) Show that the maximum flow between any two vertices is equal to minimum of the capacities of all cut-sets with these two vertices.

OR

(b) State and prove max- flow -min-cut theorem

3. (a) Solve the recurrence relation $a_n-5a_{n-1}+6a_{n-2}=2, a_0=2, a_1=-8$.

OR

(b) Find the generating function of recurrence relation $a_n=4a_{n-1}; a_0=1$.

4. (a) State and prove 5-colour theorem for planar graphs.

OR

(b) Prove that a graph G with n vertices has a Hamiltonian path if the sum of the degrees of every pair of vertices v_i, v_j in G satisfies the condition.

$$d(v_i)+d(v_j)\geq n-1$$

5. (a) Let a_n denote the number of ways of computing the product of n matrices. For example, the product of 3 matrices ABC could be computed in 2 ways : (AB)C or A (BC).

Prove that $a_n=\dfrac{(2n-2)!}{n!(n-1)!}$

OR

(b) Determine the number of ways of placing $2t+1$ in distinguishable balls in three distinct boxes so that any *two* boxes together will contain more balls than the other one.

$(15\times 4=60)$

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