LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **MATHEMATICS**

THIRDSEMESTER – APRIL 2018

16PMT3ES01- COMBINATORICS

Date: 05-05-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Answer all questions:

I a) Define partition of an integer n and find the value of P(3) and P(4).

OR

b) Generate the value of a_5, if $a_n + n\, a_{n-1} - n! = 0$, if $a_0 = 0$. (5)

c) i) Prove that there exist a bijection between the set of distribution of n-distinct objects into m- distinct boxes with exclusion principle.

ii) Derive the Striling numbers of the first kind and tabulate the value for S_7^7. (6+9)

OR

d) Prove that, if n lines in a plane are in general position and no three are concurrent. What is the number of regions into which they divide the plane? (15)

II a) Derive Sieve formula. Illustrate with an example.

OR

b) Derive Euler's function. (5)

c) State and prove Multinomial theorem.

OR

d) Define symmetric function and briefly explain the different kinds of symmetric function with illustrations. (15)

III a) Find the rook polynomial for the diagram 

OR

b) Define permanent of a matrix and find $per\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}$. (5)

c) State and prove Burnside's lemma.

OR

d) In how many ways can 5 married couples be seated at a circular table such that men and women alternate, but no husband sits next to his wife. (15)

(P.T.O)

IV a) Define direct sum and Wreath product of G on H.

OR

b) How the 24 rotational categories cyclic permutation group be classified. (5)

c) State and prove Polya's enumeration theorem.

OR

d) Find the cycle structure of the permutations for the cube about the rotations induced by i) edges ii) faces. (15)

V a) State and prove Harary and Palmer power group theorem.

OR

b) How many patterns of colouring with at the most two colours of the faces of a cube are invariant. (5)

c) State and prove de Bruijn extension of Polya's theorem.

OR

d) State and prove Red field super position theorem and find A*B and N(A*B) for the cyclic index of cube face group and tetrahedron-edge group. (15)

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