

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



M.Sc. DEGREE EXAMINATION – MATHEMATICS

THIRD SEMESTER – NOVEMBER 2018

17PMT3ES01 – COMBINATORICS

Date: 02-11-2018

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

Answer all questions:

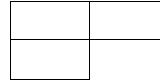
- I a) How many five- letter words of binary digits are there?
Or
b) Find the partitions of 4-set into 3 classes. (5)
- c) i) Prove that there exist a bijection between the set of distribution of n-distinct objects into m- distinct boxes with exclusion principle.
ii) Derive the Strling numbers of the first kind and tabulate the value for S_7^7 . (8+7)
Or
d) i) In how many ways can we display ten currency notes, not necessarily of different denominations of One Rupee, Two Rupees, Five Rupees, Ten Rupees, Twenty Rupees, Fifty Rupees and One Hundred Rupees?
ii) How many words of length 4,5 and 6 can be formed from the word “UNIVERSAL”. (8+7)
- II a) How many different increasing four-letter word can be can be formed from 4 A's, 3 B's and 2 E's with $A < B < E$.
Or
b) Define ordinary generating function with an example. (5)
- c) i) Prove that the formal power series forms an algebra.
ii) In how many ways a total of 16 be obtained by rolling 4 die once? (7+8)
Or
d) If n lines are in general position, what is the number of regions into which they divide the line? (15)
- III a) Define symmetric function with an example.
Or
b) Given $\lambda \rightarrow N$, prove that k_λ is a linear combination of the s_μ 's. (5)

c) Briefly explain the four types of symmetric functions.

Or

d) If $\varphi_{\mu\lambda}$ is the number of matrices of non-negative integers with column totals $\lambda_1, \lambda_2, \dots$ and row totals μ_1, μ_2, \dots then prove that φ is symmetric. (15)

IV a) Find the rook's polynomial for the



diagram

Or

b) Prove the recurrence relation, $R(t, C) = t R(t, C_{dd}) + R(t, C'_d)$ for the rook Polynomial. (5)

c) In how many ways 5 married couples be seated at a circular table such that no husband sit next to his wife and men and women alternate each other.

Or

d) Briefly explain the problem of Fibonacci. (15)

V a) How the 24 rotational categories of a cube which maps onto itself be classified?

Or

b) Find the cycle structures of all permutations of 20 beads on a circular necklace generated by a single permutation. (5)

c) Tabulate and explain the cycle index of permutation group of a cube with respect to i) vertices ii) faces.

Or

d) State and prove Polya's enumeration theorem. (15)
