VCD..130522..SEM II MATHEMATICS II 75 MARKS 2 HRS 30 MIN

Q. 1) Attempt the following **[36 MARKS]**

1) The coefficient of ab^2c^2 in the expansion of $(a+b+c)^5$

a) 15 b) 30 c) 10 d) 20

2) In the expansion of $(x_1 + x_2 + \cdots + x_r)^n$, number of terms are_____.

a) $\binom{n}{r}$ b) $\binom{n+r-1}{r-1}$ c) $\binom{n+r-1}{r}$ d) $\binom{n-r}{r-1}$

3) __non-negative solution are there for an equation a+b+c =10, where a,b,c ≥ 0

a) 10 b) 12 c) 11 d) 66

4) In____many ways can the letters of the word 'LEADER' be arranged.

a) 72 b) 144 c) 360 d) 6!

5) At a party there are n men and n women. How many ways are there for the dance if everyone has to change partners?

a) n! b) Dn c) (n − 2)! d) (n-1)!

6) φ(11) is:

a) 13 b) 10 c) 14 d) 12

7) Degree of recurrence relation $a_n = a_{n-3} + a_{n-1}$ is_

a) 1 b) 2 c) 3 d) 4

8) If $a_n = a_{n-1} + 4$ and $a_0 = 2$, then a_2 =

a) 6 b) 8 c) 10 d) 12

9) Which of the following is a linear non homogenous recurrence relation?

a) $a_n = 3\,a_{n-2} + 2\,a_{n-1}$ b) $a_n - 7\,a_{n-1} + 12\,a_{n-2} = 0$

c) $a_n - 3\,a_{n-1} = 4n$ d) $a_n - 12\,a_{n-5} = 0$

10) Characteristic roots of recurrence relation $a_n - 7a_{n-1} + 10\,a_{n-2} = 0$ are

a) 7, 10 b) 2, 5 c) -7, -10 d) -2, -5

11) A one - to- one mapping of a set A={$a_1, a_2, \ldots, a_n$} onto itself is called_______.

a) Permutation b) combination c) disjoint cycle d) cyclic Permutation

12) Two cycles of a set A are said to be disjoint if there is____common element in both cycles.

a) no b) one c) two d) many

13) The set of all subsets of set A is called the___________set of A.

a) Proper subset b) universal set c) singleton set d) power set

14) A set which is not countable is called_________ set.

a) Denumerable b) countable c) uncountable d) proper

15) Rising factorial $[\,9\,]^{3}$ =______.

a) 9×9×9 b) 9×8×7 c) 9^3 d) 9×10×11

16) S(n, 1) =_____.

a) 0 b) 1 c) n d) n-1

17) In class of 25 students_____minimum students are there who were born in same month.

a) 2 b) 3 c) 4 d) 25

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18) The total number of partitions of a set with n elements is called______number.

a) Bell b) sterling c) countable d) proper

Q. 2 A) Attempt the following (Solve any 01) **[08 MARKS]**

1) i) If A and B are countable sets then prove that A x B is countable.

ii) A and B are two non-empty finite sets with $A \cap B = \emptyset$ prove that $|A \cup B| = |A| + |B|$

2) i) Prove that Q is countable.

ii) In how many ways can we draw a heart or a spade from an ordinary deck of playing cards? A heart or an ace? A card numbered 2 through 10?

B) Attempt the following (Solve any 01) **[05 MARKS]**

1) Prove that : $S(n, 2) = 2^{(n-1)} - 1$

2) How many minimum people are required to guarantee that (i) atleast 2 of them are born exactly at same hour, minute and second? (ii) atleast 5 of them are born exactly at same hour, minute and second?

Q. 3 A) Attempt the following (Solve any 01) **[08 MARKS]**

1) i) State and prove the Vandermonde's Identity

ii) State the Binomial theorem. Find the coefficient of x^3y in the expansion of $(x + y)^4$.

2) i) State and prove Pascal's Identity.

ii) State the Multinomial number. Find the coefficient of x^2y^2z in expression $(2x - 3y + 4z)^5$.

B) Attempt the following (Solve any 01) **[05 MARKS]**

1) Prove Derangement formula $d_n = n! * \sum_{k=o}^{n} \frac{(-1)^k}{k!}$.

2) How many non- negative solutions are there to the equation $x_1 + x_2 + x_3 + x_4 + x_5 < 21$?

Q. 4 A) Attempt the following (Solve any 01) **[08 MARKS]**

1) i) Prove that the product of two even permutation is even.

ii) Define the terms a) cyclic Permutation b) Even and odd permutation

2) Let A = {1, 2, 3, 4, 5, 6} and $P_1 = \begin{pmatrix} 1\,2\,3\,4\,5\,6 \\ 3\,4\,1\,2\,6\,5 \end{pmatrix}$, $P_2 = \begin{pmatrix} 1\,2\,3\,4\,5\,6 \\ 2\,3\,1\,5\,4\,6 \end{pmatrix}$, $P_3 = \begin{pmatrix} 1\,2\,3\,4\,5\,6 \\ 6\,3\,2\,5\,4\,1 \end{pmatrix}$.

Compute (1) $(P_2 O P_3)^{-1}$ (2) $P_3^{-1} O P_2^{-1}$ (3) $(P_1 O P_2) O P_3$

B) Attempt the following (Solve any 01) **[05 MARKS]**

1) Solve the recurrence relation $a_n = -2a_{n-1} + 2a_{n-2} + 4a_{n-3}$, $a_1 = 0$, $a_2 = 2$, $a_3 = 8$.

2) Solve the recurrence relation $a_n = 2a_{n-1} - 2a_{n-2}$, $a_1 = 1$, $a_2 = 4$.