Discrete Mathematics-MATH 150

ASSIGNMENT-3

2nd Semester 2016-17

Section-I (1 mark for each)

State whether the following statements are true or false-

1. Mathematical induction, strong induction and well ordering are not equivalent principles.
2. $a_{n=a_{n-1}+a^2}{}_{n-2}$ is a linear homogeneous recurrence relation
3. $C(6,2) = \frac{P(6,2)}{2}$
4. The Basis Step in *Mathematical Induction* is *"Show that P(1) is true* , $n \geq 1$.*"*
5. If *16* objects are placed into *15* boxes, then there is at least one box containing 3 objects.
6. The first five Fibonacci numbers are: 1,1, 2,3,5,8.

1	2	3	4	5	6

Section-II **(1 mark for each)**

Select one of the alternatives from the following questions as your answer-

1. permutations of the letters ***ABCD*** is equal
   A. 24
   B. 12
   C. 4
   D. 6
2. *If* f is defined recursively by $f_n = 2f_{n-1}$ $with$ $f_0 = 3$ for positive integers n, then f_2 is

   A. 12
   B. 6
   C. 3
   D. 2

3. The coefficient of x^4y^3 in the expansion of $(x + y)^7$ is
   A. 21
   B. 30
   C. 32
   D. 35

4. If $P(5, r) = 5!$, then the value of r
   A. 0
   B. 1
   C. 3
   D. 5

5. The characteristic equation of the recurrence relation $a_n = c_1 a_{n-1} + c_2 a_{n-2}$ is obtained by substituting
   A. $a_n = r^2$
   B. $a_n = r^{-2}$

C. $a_n = r^{-1}$
D. $a_n = r$

6. The roots of a characteristic equation of a linear homogeneous recurrence relation are $1, 2, 3$. The general solution of the recurrence relation is in the form
   A. $a_n = c_1 2^n + c_2 3^n + c_3 2^n$
   B. $a_n = c_1 2^{-n} + c_2 3^{-n} + c_3 2^{-n}$
   C. $a_n = c_1 + c_2 2^n + c_3 3^n$
   D. $a_n = c_1 + c_2 n.2^n + c_3 n^2.3^n$

	1	2	3	4	5	6
ANSWER						

Section-III **(3 marks for each)**

Solve the following questions

1. Use mathematical induction to show that
$1 + 2^1 + 2^2 + \cdots + 2^n = 2^{n+1} - 1,\ n \geq 0, \forall n \in N.$

2. There are **7** juniors and **9** seniors in a Service Club. The club wants to send **5** representatives to a Conference.

   a) How many ways are there to select **2** juniors and **3** seniors

   b) How many ways are there to select the chairman from the seniors, and the rest are juniors

3. Find the first 3 terms in the expansion of $(3x + y)^5$.

4. Find the general solution of the recurrence relation
$a_n = 5a_{n-1} - 6a_n$, with $a_0 = 2$, and $a_1 = 5$.

5. Find $f(1), f(2), f(3)$ and $f(4)$, if $f(n)$ is defined recursively by $f(0) = 1$ and for $n = 0,1,2,3, \ldots$

a. $f(n+1) = f(n) + 2$

b. $f(n+1) = 2^{f(n)}$.

6. Somebody can choose pictures from four lists. The four lists contain 18, 6,12,4 pictures respectively. There is no picture is on more than one list. How many possible ways can choose 4 pictures by select one picture from each list

Good luck