KATHMANDU UNIVERSITY
End-Semester Examination
August, 2018

Marks scored:

Level : B.Sc.
Year : III

Course : MATH 322
Semester: II

Exam Roll No. :

Time : 30 mins

F.M. : 20

Registration No.:

Date : AUG 15 2018

SECTION "A"

[10 Q. × 1 = 10 marks]

Fill in the blank space(s) by writing most appropriate word(s) or symbols(s).

1. The recurrence relation for the sequence 3, 7, 11, 15, 19, ..., is ....
2. The generating function for the sequence 1, 2, 3, 4, ..., is f(x) = ...
3. The tenth term of the Lucas numbers is ....
4. A declarative sentence that is either true or false, but not both, is ....
5. A commutative ring with unity is .... it has no proper divisor of zero.
6. $\lfloor 5.3 \rfloor \lceil 8.1 \rceil$ = ...
7. If GCD(a, b) = 1, then a and b are ....
8. A monoid is a semi group that has ....
9. A binary relation R from A to B is .... of A × B.
10. A finite integral domain is ....

SECTION "B"

[10 Q. × 1 = 10 marks]

Fill in the blank space(s), **DO NOT TICK**, by choosing the most appropriate answer from among the given ones.

11. If a fair coin is tossed four times then the probability of getting two heads and two tails is ....
[1/8; 3/8; 5/8; 7/8]

12. For two real valued functions f and g defined by $f(x) = x^2 - 2$ and $g(x) = 2x - 3$, then (gof)(- 2) is ....
[- 4; - 1; 1; 4]

13. The number of ways of selecting one student as a class representative in a class having 13 boys and 4 girls, is ....
[4; 13; 26; 52]

14. The coefficient of x^5y^2 in the expansion of $(2x - 3y)^7$ is ....
[6042; 6044; 6046; 6048]

15. The relation $b_n = 3\ b_{n-1} + 2\ b_{n-3}$ is a linear homogeneous recurrence relation with constant coefficient of order ....

[1; 2; 3; 4]

16. If g is the mod-11 function, then g(279) = ...

[0; 2; 4; 6]

17. The symmetric group S_4 of an equivalent triangle under the operation of composition of two permutations is of order ....

[4; 8; 16; 24]

18. The greatest common divisor of 1356 and 2568 is

[3 ; 4; 9; 12]

19. The number of different bit strings of length 7 is ....

[32; 64; 128; 144]

20. The symmetric difference $A \Delta B$ between two intervals A = [0, 3] and B = [2, 7) is ....

[(3, 7); [3, 7); (3, 7]; [3, 7]]

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AUG 1 5 2018

Level : B.Sc.
Year : III
Time : 2 hrs. 30 mins.

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Semester: II
F.M. : 55

SECTION "C"
[3 Q.×7=21 marks]

1. Define the disjunction ($\vee$) between two statements p_1 and p_2. Give the recursive definition for the conjunction of statements $p_1, p_2, p_3, \ldots, p_n, p_{n+1}$, where $n \in Z^+$, $n \geq 2$ and then prove the generalized associative law for $\vee$. [1+2+4]

2. Write the second order linear homogeneous recurrence relation with constant coefficients and the formulas for its solution. Also, solve the recurrence relation $F_{n+2} = F_{n+1} + F_n$ where $n \geq 0$ and $F_0 = 0, F_1 = 1$. [1+3+3]

OR

Define generating function with example. Also, use it to solve the recurrence relation $d_n = 6d_{n-1} - 9d_{n-2}$ where $d_0 = 2$ and $d_1 = 3$. [3+4]

3. Define a group. Also, show that (G, $*$) is an Abelian group where G is a set of nonzero real number and $a * b = (a.b)/2$ for each a, b in G. [2+5]

SECTION "D"
[6 Q.×4=24 marks]

4. Determine the number of positive integers n where $1 \leq n \leq 3000$ and n is not divisible by 7 or 8.

5. State the multinomial theorem and then evaluate the coefficient of $x\,y\,z^2$ in $(2x - y - z)^4$.

OR

Solve the nonlinear homogeneous recurrence relation with constant coefficients $c_n = 5c_{n-1} - 6c_{n-2} + 8n^2$ where $c_0 = 4$ and $c_1 = 7$.

7. If f: A $\rightarrow$B and g: B $\rightarrow$C are onto functions then prove that the composition gof is onto.

8. Find the integer solution of $10x + 14y = 144$ where $x, y \geq 0$.

9. Define an order of a group. Also, state and prove Lagrange' theorem for finite group.

10. Use Euclidean Algorithm to find the gcd(a, b) with a = 16784 and b = 24648, and then express it as a linear combination of a and b..

SECTION "E"

[5 Q.×2=10 marks]

11. Use the principle of mathematical induction to prove that "5 divides ($n^5 - n$)" where n is non-negative integers.

12. Find the number of onto functions from set A = {1, 2, 3, 4, 5, 6, 7} to B = $\{w, x, y, z\}$.

13. Find the partition of G = ($\mathbf{Z}_{12}$, +) relative to its subgroup H = {[0], [4], [8]}.

14. Verify the equivalence relation of $p \wedge (\sim q \vee r)$ and $p \vee (q \wedge \sim r)$.

15. For non-empty sets A, B, C, prove that $A \times (B - C) = (A \times B) - (A \times C)$.