KATHMANDU UNIVERSITY
End-Semester Examination [C]
June 2018

Mark Scored:

Level : B.Sc.
Year : III

Course : MATH 322
Semester: II

Exam Roll No.:

Time: 30 mins.

F.M. : 20

Registration No.:

Date JUN 11 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 sample space A of an experiment is itself .... event.
2. The generating function for the sequence 1, -1, 1, -1, ..., is $f(x)$ = ...
3. The sentence $P(x) : x < 2$ is ....
4. The sum of two odd integers is ....
5. A commutative ring with unity is .... it has no proper divisor of zero.
6. For positive integers a and b, lcm (a, b). α = a.b, where α is ....
7. For statements p, q, r, the dual of $(p \wedge q) \vee r$ is ....
8. Every group of prime order is ....
9. A real function g is onto if Ran(g) is ....
10. If g is a real valued function defined by $f(x) = x^2 + 4$, then $f^{-1}(4)$ 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 and B are non-empty sets with n(A) = 3 and n(B) = 5, then the number of one – one functions from A to B, is ....
    [45; 50; 60; 75]

12. The cardinality of the relation R defined on A = {1, 2, 3, 4, 6} such that "a R b $\Leftrightarrow$ a is multiple of b" is ....
    [8; 10; 12; 14]

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^3z^4 in the expansion of $(x + y + z)^7$ is ....
[25; 35; 45; 55]

15. The number of positive integers m where $1 \leq m \leq 100$ that is not divisible by 3 is ....
[47; 57; 67; 77]

16. If g is the mod-12 function, then g(1259) + g(743) = ...
[20; 22; 24; 26]

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 1820 and 231 is
[3; 4; 5; 7]

19. The twelfth Fibonacci number is ....
[55; 112; 126; 144]

20. The existence of inverse property holds in ....
[groupoid; semi-group; monoid; group]

KATHMANDU UNIVERSITY
End-Semester Examination [C]
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JUN 1 1 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 meet(∧) of two statements. Give the recursive definition of meet of statements $p_1, p_2, p_3, \ldots, p_n, p_{n+1}$, and then prove the generalized associative law for meet on statements. [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 $c_n = 2(c_{n-1} - 6c_{n-2})$ where $n \geq 2$ and $c_0 = 1$, $c_1 = 2$. [1+3+3]

OR

State the Burnside's theorem on a finite group of permutation. Also, apply it to find the number of ways the eight people can be arranged around a circular table if two arrangements are considered equivalent when one can be obtained from the other by means of a clockwise rotation through $i.45^0$, for $0 \leq i \leq 7$. [3+4]

3. Define a group and with example. Also, if H is a finite nonempty subgroup of a group G then prove that H is a subgroup if and only if H is closed under the binary operation of G. [2+1+4]

SECTION "D"

[6 Q.×4=24 marks]

4. Determine the number of positive integers m where $1 \leq n \leq 1000$ and m is not divisible by 2, 3 or 5.

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

OR

Apply the method of the generating function technique to solve the recurrence relation $a_n = 3a_{n-1} + n$ where $n \geq 1$ and $a_0 = 1$.

7. Sate and prove the Division Algorithm Theorem for integers.

8. Find the integer solution of $6x + 10\,y = 108$ where $x\,,y \geq 0$.

9. Find the GCD(d) of 14268 and 16234 and express it as linear combination of given integers.

10. If S, T ⊆ U, the show that S and T are disjoint if and only if S ∩ T = ϕ, where the symbols have their usual meanings.

SECTION "E"

[5 Q.×2=10 marks]

11. Use the principle of mathematical induction to prove that for each integer $n > 4$, $2^n > n^2$.

12. Find the inverse of real function h defined as $h(x) = 2x + 3$.

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

14. If a, b, c are positive integers with $c = \gcd(a, b)$ then prove that c^2 divides ab.

15. For non-empty subsets A, B, C, show that $(A \cup B) \times C = (A \times C) \cup (B \times C)$, where symbols have their usual meanings.