Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2018

Level : B.E./B. Sc.
Year : II

Course : MCSC 201
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date JAN 17 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 domain of the floor function is ....
2. The expression 0*(0 ∨ 1)* over a set A is a(an)................expression.
3. $\lceil -35.5 \rceil =$ ....
4. If the real valued function f defined by $f(x) = x^2 - 1$, then $f^{-1}(8)$ is ....
5. If $B = \begin{bmatrix} 2 & -5 \\ 3 & 1 \end{bmatrix}$ a square matrix, then $B^2 =$ ....
6. The vertices of a tree that have no offspring are known as .... of that tree.
7. A statement that is true for all possible values of is propositional variables is called ....
8. A path that begins and ends at the same vertex is ....
9. Every subgroup of an Abelian group is ....
10. A sentence of the form P(x) is known as ....

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 we select any group of 1000 students on KU campus, then at least .... of them must have the same birthday.
[2; 3; 6; 9]
12. A rooted tree (T, v_0) on a set is ....
[reflexive; symmetric; asymmetric; antisymmetric]

13. The permutation $p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 5 & 7 & 6 & 3 & 1 \end{pmatrix}$ is ....

[disjoint; even; odd; cycle]

14. If L is a lattice such that $a \vee b = a$ for each a, b in L, then we have ....

[$a < b$; $b < a$; $a \leq b$; $b \leq a$]

15. A relation R on a set A is .... if $R \cap R^{-1} = \phi$.

[reflexive; symmetric; asymmetric ; transitive]

16. If B = {a, b, c} and C = {x : x being positive integers, x^3 <100}, then n(B × C) = ...

[6; 8 ; 12; 16]

17. If g is the mod-7 function, then g(170) = ...

[0; 1; 2; 3]

18. The number of different permutations of the letters in the word 'BHAKTA' is ....

[350 ; 360 ; 370 ; 380]

19. A connected graph G with 10 vertices has Hamiltonian circuit if each vertex has degree greater than or equal to ....

[3; 5; 7 ; 10]

20. The probability that when two dices are rolled, the sum of the numbers on the two dice being seven is ....

[1/8; 1/6; 1/4; 1/2]

KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2018

JAN 17 2018

Level : B.E./B. Sc.
Year : II
Time : 2 hrs. 30 mins.

Course : MCSC 201
Semester: I
F. M. : 55

SECTION "C"
[3 Q. × 7 = 21 marks]

1. State the Division Algorithm Theorem and define GCD of two positive integers. Prove that if GCD(a, c) = 1 and c | ab, then c | b, symbols have their usual meanings. [2+2+3]

2. Define a relation and the complement & inverse operations on relations from a set A to another set B. If R and S ate relations from A to B, then prove that
(i) $(R \cup S)^{-1} = R^{-1} \cup S^{-1}$ and (ii) $\overline{R \cup S} = \overline{R} \cap \overline{S}$. [3+ 4]

OR

Define an equivalence relation on a set? How is it related to the partition of that set? Also, show that the relation R = {(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 3), (3, 3), (4, 4)} defined on A = {1, 2, 3, 4} is an equivalent and give its quotient set. [2+1+ 3+1]

3. Define a group with example. Prove that the inverse element of a group if it exists, is unique. Also, if G be a group of all non-zero real numbers and let a*b = (ab)/2, then show that (G, *) is an Abelian group. [1 +2+ 4]

SECTION "D"
[6 Q. × 4 = 24 marks]

4. For given two lattices (L_1, ≤) and (L_2, ≤), show that (L, ≤) is a lattice where $L = L_1 \times L_2$ and partial order ≤ of L is the product partial order.

5. State the principle of mathematical induction and use it to prove that
$1 + 2 + 3 + \ldots + n < (2n+1)^2/8$, for all non negative integers n ≥ 2. [1+3]

6. Use Euclidean algorithm to express GCD (d) of the integers 1976 and 1776 as a linear combination.

7. Define a Boolean matrix. Compute P ∨ Q, P ∧ Q and P ⊗ Q, symbols have their usual meanings, for the give matrices, $P = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$ and $Q = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$. [1+3]

8. Find the transitive closure for the relation R defined on A = {1, 2, 3, 4}by {(1, 1), (1, 4), (2, 2), (2, 3), (3, 2), (3, 3), (4, 1), (4, 4)}.

OR

Define the completeness of a graph with n vertices. Also, draw the complete graph on five vertices. [2+2]

9. Solve the recurrence relation: $c_n = 4c_{n-1} - 4c_{n-2}$ with initial conditions $c_1 = 1$ and $c_2 = 7$. Also, give the first four terms of the sequence. [3+1]

SECTION "E"

[5 Q. × 2 = 10 marks]

10. Construct the truth table for the Boolean function $T : B_3 \to B$ determined by Boolean polynomial $p(x, y, z) = (x \wedge y) \vee (x \vee (\sim y \wedge z))$ where symbols have their usual meanings..

11. For given non-empty sets A, B, C, show that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

12. Show that if any 14 integers from 1 to 25 are chosen, then one of them is a multiple of another.

13. Find the period of the permutation $p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 4 & 3 & 5 & 1 & 2 & 6 \end{pmatrix}$ defined on $A = \{1, 2, 3, 4, 5, 6\}$.

14. Determine the Hasse diagram of the relation R defined on A = {1, 2, 3, 4} by the rule R = {(1, 1), (1, 2), (1, 3), (1, 4), (2, 2), (2, 3), (2, 4), (3, 3), (3, 4), (4, 4)}.