KATHMANDU UNIVERSITY
End Semester Examination [C]
June 2018

Mark scored:

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

Course : MCSC 201
Semester: I

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 most appropriate word(s) or symbol(s):

1. Two statements p and q are said to be logically equivalent if ..... is tautology.

2. If e be the identity element for *. Then x * e = e * x = ...

3. If U = {a, b, c, d, e, f} and A = {b, c, f}, then the finite sequence f_A is .....

4. The range of the characteristics function defined on subset A of universal set U is .....

5. If A = {a, b, c, d} and R = {(a, a), (a, b), (b, a), (b, b), (c, d), (d, c), (c, c), (d, d)} is a relation then the quotient set A/R is .....

6. In fuzzy set operation, if A and B are subsets of universal set U. Then $f_{A\cup B}(x)$ = ...

7. A path in a graph G is called a ..... if it includes every vertex exactly ones.

8. $\lceil -3.9 \rceil$ = ...

9. A group (G, *) is said to be..... if a*b = b*a for each a, b in G.

10. If the function $f: \Re \to \Re$ be defined by $f(x) = 5x + 1$, then $fof^{-1}(1)$ = ...

SECTION "B"
[10 Q.×1=10 marks]

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

11. If 26 pigeons are assigned to 5 pigeonholes then one of the pigeonholes must contain at least ..... pigeons.
[3; 4; 5; 6]

12. The number of distinguishable permutations of letters in "MANANDHAR" is .....
[40320; 30240; 40330; 40230]

13. If $A=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$ and $B=\begin{bmatrix}0 & 1\\ 1 & 1\end{bmatrix}$, then $A\otimes B=$ .....

$[\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}; \quad \begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}; \quad \begin{bmatrix}1 & 1\\ 1 & 0\end{bmatrix}; \quad \begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}]$

14. The probability that when two dice are rolled, the sum of the numbers on the two dice being 5, is .....
[1/2; 1/4; 1/9; 1/12]

15. Let $\boldsymbol{L}$ be a lattice. Then, for each a, b and c in $\boldsymbol{L}$, $a \le c$ and $b \le c$ if and only if .....
[$a > b \vee c$; $a \ge b \vee c$; $a \vee b < b$; $a \vee b \le c$]

16. The matrix $M_R = [m_{ij}]$ is asymmetric relation R has the property that if $m_{ij} = 1$, then .....
[$m_{ji} = 1$; $m_{ji} = -1$; $m_{ji} = 0$; $m_{ij} = 0$]

17. If f is the mod- 7 function, then f(1230) = ...
[3; 4; 5; 6]

18. In the group S_3, inverse of $\begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 1\end{bmatrix}$ is .....

$[\begin{bmatrix}1 & 2 & 3\\ 3 & 1 & 2\end{bmatrix}; \quad \begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 1\end{bmatrix}; \quad \begin{bmatrix}1 & 2 & 3\\ 2 & 1 & 3\end{bmatrix}; \quad \begin{bmatrix}1 & 2 & 3\\ 1 & 2 & 3\end{bmatrix}]$

19. If A = {a, b, c, d, e}, then n(P(A)) .....
[8; 16; 24; 32]

20. If the mappings $f : \Re \to \Re$, $g : \Re \to \Re$ are defined by $f(x) = 2x$, $g(x) = x - 3$, and $(g \circ f)(x) = -7$. Then x =
[2; 3; -2; - 3]

KATHMANDU UNIVERSITY
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JUN 11 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. Define GCD and LCM of two positive integers. State the "**Division Algorithm Theorem**" for integer. Also, use Euclidian algorithm to find GCD of 2045 and 2450 and express it as combination of given numbers. [2+2+3]

2. Define a graph with example. If a graph has more than two vertices of odd degree, then prove that there can be no Euler path in G

OR

Define a symmetric relation and an equivalence relation on a set? Let R be an equivalent relation on a set A then for each a, b ∈ A, prove that a R b if and only if R(a) = R(b). Let A = { p, q, r} and R be the relation on A whose matrix is $M_R = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$. Show that R is transitive. [2+3+2]

3. Define a poset. If (A, ≤) and (B, ≤) posets, then show that (A × B, ≤) is poset with partial order ≤ define by(a, b) ≤ (a', b') if a≤a' in A and b ≤b' in B. What are the least and greatest elements of M if S = {1, 2, 3, 4} and poset M = P(S). [1+4+2]

SECTION "D"
[6 Q.×4=24 marks]

4. Let A = {1, 2, 3, 4, 5, 6} , $p = \begin{pmatrix} 1 & 2 & 4 & 3 \end{pmatrix}$ and q = (5, 6, 3) be a permutation of A. Then compute p^2, p o q and p^{-1}.

5. Find an explicit formula for the sequence defined by $a_n = a_{n-1} + 3$ with initial condition $a_1 = 2$.

6. If $A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then compute $A \vee B$, $A \wedge B$ and $A \otimes B$, where the symbols have their usual meanings.

7. Let f be a homomorphism from a semi-group (S, *) to (T, *'). If S' is a sub semi-group of S, then show that f(S') = { t ∈T : t = f(s), for some s in S'}, the image of S' under f is a sub semi-group of T.

OR

Define the characteristic function and prove that $f_{A \cup B} = f_A + f_B - f_A f_B$, symbols have their usual meaning.

8. State the principle of Mathematics induction and use it to prove: $\mathbf{n! \geq 2^{n-1}}$ for all non-negative integer n.

9. Verify that the function $f : \Re \to \Re$ defined by $f(x) = 2x - 25$ satisfy the property $f^{-1} o f = I_{\Re}$, an identity on $\Re$.

SECTION "E"

[5 Q.×2=10 marks]

10. Let A and B be subsets of U, then prove that $\overline{A \cap B} = \bar{A} \cup \bar{B}$.

11. If G is a group. Then prove that each element a in G has unique inverse in G.

12. Show that the statement $\sim (p \Rightarrow q) \Leftrightarrow (p \wedge \sim q)$ is a tautology.

13. Let A = {1, 2, 3}and let R be relations on A, define as following matrix

$M_R = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{pmatrix}$. Find the $M_{R^{-1}}$ and $M_{\bar{R}}$.

14. Show that the power set $P(A)$ defined on A = {a, b, c} with set inclusion ($\subseteq$) is a Lattice.