Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name : Mathematical Concepts for Computer Science
Subject Code : 4CS01IFM2 Branch: B.Sc.I.T.
Semester : 1 Date : 19/03/2019 Time : 02:30 To 05:30 Marks : 70

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions: (14)

a) The elements of set $A=\{x / x^2-1=0,\ x\in Z\}$ are
(A) $-1,\ 1$ (B) $0,\ 1$ (C) 1 (D) None of these

b) De Morgan's law is
(A) $(P\times Q)'=P'\times Q', (P\times Q)'=P'\times Q'$
(B) $(P\cup Q)'=P'\cup Q', (P\cap Q)'=P'\cap Q'$
(C) $(P\cap Q)\times R=(P\times R)\cap(Q\times R)$
(D) $(P\cup Q)'=P'\cap Q', (P\cap Q)'=P'\cup Q'$

c) If $A=\{1,\ 2,\ 3,\ 4,\ 5\}$, $B\{4,\ 5,\ 6,\ 8\}$ then $n(A\cup B)=$ _____ .
(A) 5 (B) 6 (C) 7 (D) 8

d) If $A=\{1,\ 2,\ 3,\ 4\}$ and $f:A\to R,\ f(x)=5^x$ then range of f is
(A) $\{5,\ 10,\ 15\}$ (B) $\{5,\ 25,\ 125,\ 625\}$ (C) $\{5,\ 125,\ 625\}$
(D) $\{5,\ 10,\ 15,\ 20\}$

e) If $f(x)=\cos x$ then $f(2\pi)=$ _____ .
(A) – 1 (B) 0 (C) 1 (D) 2

f) If $P(1, 2)$ and $Q(2, 3)$ then PQ = _____.
(A) $\sqrt{2}$ (B) 2 (C) $2\sqrt{2}$ (D) None of these

g) If $A(2, 7)$ and $B(8, 3)$ are the given points, then the midpoint of AB is _____.
(A) $(-2,5)$ (B) $(5,-2)$ (C) $(2,5)$ (D) $(5,\ 5)$

h) x – intercept of line $3x+2y-7=0$ is _____.
(A) 7/2 (B) –7/2 (C) 7/3 (D) – 7/3

i) If $A=\begin{bmatrix}-8 & 4\\ -6 & 3\end{bmatrix}$ then A^{-1} = _____.
(A) $\begin{bmatrix}-8 & 4\\ -6 & 3\end{bmatrix}$ (B) $\begin{bmatrix}-3 & 4\\ -6 & 8\end{bmatrix}$ (C) $\begin{bmatrix}-8 & 6\\ -4 & 3\end{bmatrix}$ (D) Does not exist

j) If $A=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ then A^2 = _____.

(A) $\begin{bmatrix}-1 & 0\\ 0 & -1\end{bmatrix}$ (B) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (C) $\begin{bmatrix}0 & -1\\ -1 & 0\end{bmatrix}$ (D) $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$

k) If $A=\begin{bmatrix}3 & 7\\ 2 & 5\end{bmatrix}$ then $A+A^T=$ _____ .

(A) $\begin{bmatrix}6 & 10\\ 9 & 9\end{bmatrix}$ (B) $\begin{bmatrix}6 & 9\\ 10 & 9\end{bmatrix}$ (C) $\begin{bmatrix}10 & 9\\ 9 & 6\end{bmatrix}$ (D) $\begin{bmatrix}6 & 9\\ 9 & 10\end{bmatrix}$

l) $\lim\limits_{x\to 0}\dfrac{\tan x}{x}=$ _____

(A) -1 (B) 0 (C) 1 (D) None of these

m) $\lim\limits_{x\to 0}\dfrac{x^2+x+1}{x+1}$ = _____

(A) 1 (B) 0 (C) -1 (D) None of these

n) $\lim\limits_{x\to 0}\dfrac{a^x-1}{x}$ = _____

(A) $\log_a e$ (B) $\log_e a$ (C) e (D) 1

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a) If $U=\{1,\ 2,\ 3,\ 4,\ 5\}$, $A=\{1,\ 2,\ 3\}$, $B=\{2,\ 3,\ 4\}$, $S=\{1,\ 3,\ 4\}$ and $T=\{2,\ 4,\ 5\}$ then verify $(A\times B)\cap(S\times T)=(A\cap S)\times(B\cap T)$. **(5)**

b) If $S=\{x,\ y,\ z\}$ and $R=\{(x,x),(x,y),(y,z),(y,x),(z,y),(z,z),(y,y),(z,x),(x,z)\}$ then show that R is an equivalence relation. **(5)**

c) Prove that $f(x)=\log x$ then prove that **(4)**

(i) $f(xy)=f(x)+f(y)$ (ii) $f\left(\dfrac{x}{y}\right)=f(x)-f(y)$

Q-3 **Attempt all questions** **(14)**

a) If $U=\{-3,-1,0,1,3\}, A=\{-3,-1,1\}, B=\{-1,1,3\}$ and $C=\{-1,0,1\}$ then verify the following: **(5)**

(i) $B-A=A'\cap B=B-(A\cap B)$ (ii) $A\Delta B=(A-B)\cup(B-A)$

(iii) $A\cup B=A\cup\left[B-(A\cap B)\right]$

b) If $f(x)=\log\left(\dfrac{1+x}{1-x}\right)$ then prove that $f\left(\dfrac{2x}{1+x^2}\right)=2f(x)$. **(5)**

c) If $f(x)=\dfrac{1-x}{1+x}$ then prove that $f(x)+f\left(\dfrac{1}{x}\right)=0$. **(4)**

Q-4 **Attempt all questions** **(14)**

a) If the area of a triangle with vertices $A(2,3), B(-4,1)$ and $C(1,a)$ is 2 sq. **(5)**

units then find the value of a.

b) Draw the graph of the function $f(x)=x^2$. **(5)**

c) Discuss the continuity of $f(x)=\begin{cases}\dfrac{|x|}{x} & ; x\neq 0\\ 0 & ; x=0\end{cases}$ at $x=0$. **(4)**

Q-5 **Attempt all questions** **(14)**

a) Draw the figure which shows the graph of relation $2x+3y=4$ and find x and y intercepts of the relation given by $2x+3y=4$. **(5)**

b) Express the matrix $\begin{bmatrix}-1 & 2 & 3\\ 2 & -4 & 1\\ 4 & -2 & -3\end{bmatrix}$ as a sum of a symmetric and a skew symmetric matrix. **(5)**

c) If $A=\begin{bmatrix}2 & 3 & 6\\ -1 & 2 & 5\end{bmatrix}$, $B=\begin{bmatrix}0 & 2 & -8\\ 2 & 4 & -2\end{bmatrix}$ and $C=\begin{bmatrix}1 & 3 & -3\\ 1 & 4 & 1\end{bmatrix}$ then prove that $2A+3B-4C=0$. **(4)**

Q-6 **Attempt all questions** **(14)**

a) If $M=\begin{bmatrix}2 & 3\\ 0 & 1\end{bmatrix}$, $N=\begin{bmatrix}3 & 4\\ 2 & 1\end{bmatrix}$ then prove that $(MN)^T=N^TM^T$. **(5)**

b) Find the equation of straight line passing through (3, 4) and parallel to line $\frac{x}{2}+\frac{y}{2}=1$. **(5)**

c) Evaluate: $\lim\limits_{x\to 2}\dfrac{x^7-128}{x^4-16}$ **(4)**

Q-7 **Attempt all questions** **(14)**

a) Prove that $\lim\limits_{x\to 3}\dfrac{\sqrt{x+2}-\sqrt{5}}{\sqrt{x+4}-\sqrt{7}}=\dfrac{\sqrt{35}}{5}$. **(5)**

b) Evaluate: $\lim\limits_{x\to 0}\dfrac{3^{2x}-2^{2x}}{x}$ **(5)**

c) Show that the points $A(1, 2)$, $B(2, 3)$ and $C(0, 5)$ are the vertices of a right angled triangle. **(4)**

Q-8 **Attempt all questions** **(14)**

a) Show that $A=\begin{bmatrix}-2/3 & 1/3 & 2/3\\ 2/3 & 2/3 & 1/3\\ 1/3 & -2/3 & 2/3\end{bmatrix}$ is orthogonal. **(5)**

b) In which ratio Y – axis divides line segment joining points (1, 2) and (2, 1)? Find coordinates of division point. **(5)**

c) If $A=\{a,b,c,d,e\}, B=\{d,e,f,g\}$ then obtain $n(A)$, $n(B)$, $n(A\cap B)$ and $n(A\cup B)$. **(4)**