C.U.SHAH UNIVERSITY
Summer Examination-2018

Subject Name : Fundamental Mathematics for Computer

Subject Code : 4CS01IFM1   **Branch: B.Sc. I.T**

Semester : 1   **Date : 27/03/2018**   **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) De Morgan's law is

(A) $(A \times B)' = A' \times B', (A \times B)' = A' \times B'$ (B) $(A \cup B)' = A' \cup B', (A \cap B)' = A' \cap B'$

(C) $(A \cap B) \times C = (A \times C) \cap (B \times C)$ (D) $(A \cup B)' = A' \cap B', (A \cap B)' = A' \cup B'$

b) If $A = \{a,b,c,d,e\}$, $B\{d,e,f,g\}$ then $n(A \cup B) = $ _____ .

(A) 5 (B) 6 (C) 7 (D) 8

c) The elements of set $A = \{x / x^3 - x = 0, \ x \in Z\}$ are

(A) −1, 0, 1 (B) 0, 1 (C) 1 (D) None of these

d) If $A = \begin{bmatrix} 1 & -3 & 4 \\ -2 & 1 & 2 \end{bmatrix}$ then $A^T = $ _____.

(A) $\begin{bmatrix} 1 & -2 \\ -3 & 1 \\ 4 & 2 \end{bmatrix}$ (B) $\begin{bmatrix} -2 & 1 & 2 \\ 1 & -3 & 4 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 2 \\ 3 & 1 \\ 4 & 2 \end{bmatrix}$ (D) None of these

e) If $A = \begin{bmatrix} 7 \\ 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 4 \end{bmatrix}$ then A + B = _____.

(A) $\begin{bmatrix} 10 & 6 \end{bmatrix}$ (B) $\begin{bmatrix} 10 \\ 6 \end{bmatrix}$ (C) $\begin{bmatrix} 21 & 8 \end{bmatrix}$ (D) Not possible

f) If $\begin{vmatrix} x & -2 \\ 3 & -5 \end{vmatrix} = -4$ then x = _____.

(A) −2 (B) 2 (C) −5 (D) 5

g) If A(2, −7) and B(8, 3) are the given points, find the midpoint of AB.

(A) $(-2,5)$ (B) $(5,-2)$ (C) $(2,5)$ (D) $(5,2)$

h) Slope of the line x + y − 8 = 0 is _____.

(A) 1 (B) − 1 (C) −1/8 (D) 8

i) 300° = _____Radian

(A) $\dfrac{5\pi}{2}$ (B) $\dfrac{2\pi}{5}$ (C) $\dfrac{3\pi}{5}$ (D) $\dfrac{5\pi}{3}$

j) $\dfrac{5\pi}{6} = \underline{\quad}°$

(A) $160°$ (B) $155°$ (C) $150°$ (D) $145°$

k) $\dfrac{d(x^n)}{dx} = \underline{\quad}$

(A) n (B) nx (C) nx^n (D) nx^{n-1}

l) $\dfrac{d\left(\dfrac{1}{x}\right)}{dx} = \underline{\quad}$

(A) $\dfrac{1}{x}$ (B) $-\dfrac{1}{x}$ (C) $-\dfrac{1}{x^2}$ (D) None of these

m) $\int \dfrac{1}{\sqrt{1-x^2}} dx = \underline{\quad}$

(A) $\tan^{-1} x + c$ (B) $\cot^{-1} x + c$ (C) $\cos^{-1} x + c$ (D) $\sin^{-1} x + c$

n) $\int_0^1 x\, dx = \underline{\quad}$

(A) 1 (B) $1/2$ (C) 2 (D) None of these

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

Q-2 **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 **(5)**
the following:
(i) $(A \cup B)' = A' \cap B'$ (ii) $B - A = A' \cap B = B - (A \cap B)$ (iii) $(B')' = B$

b) If $A = \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 1 \\ 2 & -3 \end{bmatrix}$ then prove that $(A+B)^T = A^T + B^T$. **(5)**

c) Prove that (12, 8), (− 2 , 6) and (6, 0) are the vertices of an isosceles right angled **(4)**
triangle.

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

a) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then prove that $A^2 - 5A - 2I = O$. **(5)**

b) Find the points of trisection for the line segment joining the points (4, 5) and **(5)**
$(13, -4)$.

c) If $A = \{1,2,3,4,5,6\}, B = \{2,5,6,8\}$ and $C = \{1,6,7\}$ then prove that **(4)**
$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$.

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

a) If $A = \{2, 3\}$, $B = \{4, 5\}$ and $C = \{5, 6\}$ then evaluate (i) $A \times (B \cup C)$ **(5)**
(ii) $A \times (B \cap C)$ (iii) $(A \times B) \cup (B \times C)$

b) If the area of a triangle with vertices $A(3,5), B(9,3)$ and $C(5,k)$ is 7 sq. units **(5)**
then find the value of k.

c) If $A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -2 \\ 0 & 5 \\ 3 & 1 \end{bmatrix}$ then find value of $2A - 3B$ and $3A - 2B$. **(4)**

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

a) Draw the graph of $y = \cos x$ $\left(\dfrac{-\pi}{2} \le x \le \dfrac{\pi}{2} \right)$. **(5)**

b) Find derivative of $f(x) = \sqrt{x}$ using definition. **(5)**

c) Evaluate: $\displaystyle\int_{1}^{e} \dfrac{\log_e x}{x} dx$ **(4)**

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

a) Find $\dfrac{dy}{dx}$ if $x = \dfrac{a}{2}\left(t + \dfrac{1}{t} \right)$, $y = \dfrac{b}{2}\left(t - \dfrac{1}{t} \right)$. **(5)**

b) Evaluate: $\displaystyle\int \dfrac{(1-3x)^2}{x^3} dx$ **(5)**

c) Prove that $\tan^{-1}(\infty) + \sin^{-1}\left(\dfrac{\sqrt{3}}{2} \right) + \cos^{-1}\left(\dfrac{1}{2} \right) = \dfrac{7\pi}{6}$. **(4)**

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

a) Evaluate: $\displaystyle\int x \sin x \, dx$ **(5)**

b) Prove that $(1 + \sin A + \cos A)^2 = 2(1 + \sin A)(1 + \cos A)$. **(5)**

c) Find $\dfrac{dy}{dx}$ if $y = \dfrac{x^2 - 1}{x^2 + 1}$. **(4)**

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

a) Using matrix method solve: $5x + 3y = 11$ and $3x - 2y = -1$ **(5)**

b) Find the equation of straight line passing through origin and parallel to line $3x - 2y + 1 = 0$. **(5)**

c) Find $\dfrac{dy}{dx}$ if $e^x + e^y = e^{x+y}$. **(4)**