C.U.SHAH UNIVERSITY
Summer Examination-2017

Subject Name: Mathematical Concepts for Computer Science

Subject Code: 4CS01IFM2   **Branch: B.Sc. (IT)**

Semester: I   **Date: 28/03/2017**   **Time: 10:30 to 01:30**   **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) If two sets A and B are given, then A is subset of B , is denoted by
   a) $A \cap B$ b) $A \cup B$ c) $A \subset B$ d) $A \supset B$

b) If $A = \{2,4,5,7\}$ and $B = \{1,3,5,7\}$, then $n(B-A) = $ _____.
   a) $\{2,4\}$ b) 4 c) $\{1,3\}$ d) 2

c) If $A = \begin{bmatrix} 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, then $AB = $ _____.
   a) $\begin{bmatrix} 1 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 0 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 0 \end{bmatrix}$ d) $\begin{bmatrix} 1 \end{bmatrix}$

d) If $A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$ is a square matrix, then $|A| = $ _____.
   a) $\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$ b) 2 c) $\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$ d) -2

e) Point _____ is in the first quadrant.
   a) $(3,5)$ b) $(3,-5)$ c) $(-3,-5)$ d) $(-3,5)$

f) If two straight lines $y = m_1 x + c$ & $y = m_2 x + c$ are parallel, then _____.
   a) $m_1 = m_2$ b) $m_1 = -m_2$ c) $m_1 m_2 = 1$ d) $m_1 m_2 = -1$

g) If $\theta = \dfrac{\pi}{2}$, then the value of $\sin 2\theta + \cos 2\theta = $ _____.
   a) 2   b) 0   c) 1   d) -1

h) $\sec^2 \theta - \tan^2 \theta = \underline{\quad\quad}$.

   a) -1   b) 0   c) 1   d) none of these

i) $\dfrac{d}{dx}(\log x) = \underline{\quad\quad}$.

   a) $x \log x$ b) $x + \log x$ c) $1 + \log x$ d) $\dfrac{1}{x}$

j) $\dfrac{d}{dx}(e^{ax}) = \underline{\quad\quad}$.

   a) e^{ax} b) ae^{ax} c) $\dfrac{e^{ax}}{a}$ d) none of these

k) $\int 2\,dx = \underline{\quad\quad}$.

   a) $2x + c$ b) $2 + c$ c) 0   d) none of these

l) $\int \cos x\,dx = \underline{\quad\quad}$.

   a) $\cos x + c$ b) $\sin x + c$ c) $-\cos x + c$ d) $-\sin x + c$

m) $\dbinom{n}{n} = \underline{\quad\quad}$.

   a) n b) 1   c) 0   d) none of these

n) $_5P_3 = \underline{\quad\quad}$.

   a) 120   b) 60   c) 20   d) none of these

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

Q-2 Attempt all questions

a) If $A = \{1,2,3,5\}; B = \{2,3,5\}; C = \{1,2,4\}$, then verify that   **(05)**

   i) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ ii) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

b) If $U = \{a,b,c,d,e,f\}, A = \{a,b,c,d\}$ and $B = \{b,c,d,e\}$, then prove that   **(05)**

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

c) If $A = \{a,b,c,d,e,f\}, B = \{a,e,i,o,u\}$ and $C = \{b,e,m,n\}$, then find   **(04)**

   i) $A \cup B \cup C$ ii) $A \cap (B \cup C)$ iii) $A \cap B \cap C$ iv) $A - B$.

Q-3 Attempt all questions

a) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 2 & 0 \end{bmatrix}$ are two matrices, then verify that $(AB)^T = B^T A^T$.   **(05)**

b) Find the inverse of the matrix $A = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 1 & -1 \\ 5 & 0 & 1 \end{bmatrix}$. **(05)**

c) If $A = \begin{bmatrix} 4 & -1 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 \\ 5 & 4 \end{bmatrix}$, then find matrix $A + 2B$ and $3A - B$. **(04)**

Q-4 Attempt all questions

a) Prove that $(2, -2), (8, 4), (5, 7)$ and $(-1, 1)$ are the vertices of a rectangle. **(05)**

b) 1.) Find the area of a triangle formed by the points $(-3, 0), (2, 8), (5, 1)$. **(05)**

2.) Find the co-ordinates of a point which divides the line joining the points $(1, -2)$ and $(4, 7)$ in the ratio 2:5.

c) Find the equation of a line joining points $A(3, 5)$ and $B(6, 4)$. **(04)**

Q-5 Attempt all questions

a) Draw the graphs of: (i) $y = \sin x$, $0 \le x \le \pi$ and (ii) $y = \cos x$, $x \, \varepsilon \, [0, \pi]$. **(07)**

b) Evaluate the following:

1.) $3\sin^2 30° - \tan^2 45° + \cot^2 45° - 2\cos ec^2 30°$ 2.) $\sin \dfrac{2\pi}{3} + \cos \dfrac{7\pi}{6} + \tan \dfrac{5\pi}{3}$ **(07)**

Q-6 Attempt all questions

a) Find the differentiations of: (i) $\dfrac{x^2 + 1}{x + 1}$ and (ii) $\cos(\log x^3)$ with respect to x. **(07)**

b) i) If $x = at^2$ & $y = 2at$, then find $\dfrac{dy}{dx}$ ii) $\dfrac{d}{dx}\left(e^x \cos(2x + 3)\right)$. **(07)**

Q-7 Attempt all questions

a) Evaluate $\int x^2 e^x \, dx$ by method of integration by parts. **(05)**

b) Find: $\int \dfrac{(\log x)^4}{x} \, dx$. **(05)**

c) Find: $\int (\tan x - \cot x)^2 \, dx$. **(04)**

Q-8 Attempt all questions

a) Solve the equations $2x + 3y = 5$ and $5x - 4y = 1$ by using matrix method. **(05)**

b) Obtain the equation of a line passing through $(3, 1)$ and the point of intersection of the lines $4x + 5y + 7 = 0$ and $3x - 2y - 12 = 0$. **(05)**

c) Prove that $\begin{pmatrix} n \\ r \end{pmatrix} = \begin{pmatrix} n \\ n - r \end{pmatrix}$. **(04)**