Roll No. Total No. of Pages : 02

Total No. of Questions : 09

BMCI (2013 Batch) (Sem.–1)

MATHEMATICS – I (Bridge Course)

Subject Code : BMCI-101

M.Code : 48501

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Q1 Answer briefly :

a) If A = {1, 2, 3}, B = {3, 4, 5}, U = {1, 2, 3, 4, 5, 6, 7, 8, 9} find A – B & A ⋂ B.

b) Explain different methods of describing a set.

c) Draw Venn diagram of (A ⋂ B) ⋂ C and A ⋂ (B ⋂ C)

d) State duality principle for sets.

e) Prove that $\tan^{-1}\left(\frac{\sqrt{1-x^2}-1}{x}\right)=\frac{\tan^{-1}x}{2}, x \neq 0.$

f) If $\begin{bmatrix} a+b & 2 \\ 5 & ab \end{bmatrix}=\begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$, find the values of a & b.

g) If $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & -1 & -4 \end{bmatrix}$ verify that $(AB)^T = B^T A^T$.

h) If $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 4x + 7$ then show that $f(A) = 0$.

i) State Binomial theorem and its two applications.

j) Show that $\begin{vmatrix} \sin 10^\circ & -\cos 10^\circ \\ \sin 80^\circ & \cos 80^\circ \end{vmatrix} = 1$

SECTION-B

Q2. Consider the function : $\left[0, \frac{\pi}{2}\right] \to \mathbb{R}$, given by $f(x) = \sin x$ and $g : \left[0, \frac{\pi}{2}\right] \to \mathbb{R}$ given by $g(x) = \cos x$. Show that f and g are one-one but $f + g$ is not one – one.

Q3. If A, B, C are any three sets then prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ & $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

Q4. a) What do you mean by partition of a set. For set S = {1, 2, 3, 4, 5, 6} determine whether or not each of the following is a partition of S : P_1 {{1, 3, 5}, {2, 4, 6}}, P_2 = {{2, 4}, {1, 3, 5}, {6}}.

b) Discuss various types of functions with examples.

Q5. Find the term independent of x in the expansion of $(1 + x + x^3)\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$.

Q6. a) Give example of matrices such that AB = AC, but B ≠ C.

b) Find the value of 'x' for which the matrix $A = \begin{bmatrix} 1 & -2 & 3 \\ 1 & 2 & 1 \\ x & 2 & -3 \end{bmatrix}$ is singular.

SECTION-C

Q7. If $X = Y = Z = \mathbb{R}$ and $f : X \to Y$ and $g : Y \to Z$ are such that $f(x) = 2x + 1$, $g(y) = \frac{y}{3}$. Verify that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.

Q8. Using principle of mathematical induction prove that :

$$1.2 + 2.3 + 3.4 + \ldots\ldots\ldots + n(n + 1) = \frac{1}{3}n(n+1)(n+2).$$

Q9. Using properties of determinant prove that :

$$\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = a^3 + b^3 + c^3 - 3abc$$

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.