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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 $\cap$ B.

b) Explain different methods of describing a set.

c) Draw Venn diagram of $(A \cup B) \cap C$ and $A \cup (B \cap C)$

d) State duality principle for sets.

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

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 : $\left[0, \frac{\pi}{2}\right] \to R$, given by f(x) = sin x and g : $\left[0, \frac{\pi}{2}\right] \to R$ 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 : P1 {{1, 3, 5}, {2, 4, 6}}, P2 = {{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 $B \neq C$.

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 = 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