Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/BBA (H)/BIRM/BSCM/SEM-1/BBA-102/2011-12

2011
MATHEMATICS – I

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) ${}^5P_2$ means

      a) 10

      b) 20

      c) 3

      d) 2.

   ii) The value of $\log_3 27$ is

      a) 5

      b) 3

      c) 4

      d) 2.

iii) Which of the following is a null set ?

a) $\{0\}$

b) $\{\phi\}$

c) $\{x : x \text{ is an integer and } 1 < x < 2\}$

d) none of these.

iv) If $f(x)=\frac{ax-b}{bx-a}$ then $f(x)\,f\left(\frac{1}{x}\right)$ is

a) 0 b) 1

c) – 1 d) 2.

v) The centre and radius of the circle $x^2+y^2-4x+6y-12=0$ are respectively

a) (2, 3) and $\sqrt{5}$ units

b) (2, – 3) and 5 units

c) (– 4, 6) and 10 units

d) none of these.

vi) The sum of the binomial coefficients

$c_0+c_1+c_2+.....+c_n$ is

a) 2 b) 2^n

c) 2^{n-1} d) none of these.

vii) Sum of the first n natural numbers 1 + 2 + 3 + ... + n is

a) $\frac{n+1}{2}$ b) $\frac{n(n+1)}{2}$

c) $\frac{n(n-1)}{2}$ d) $\frac{n}{2}$.

viii) $y = x$ denotes a graph of a

a) circle b) straight line

c) particular point d) none of these.

ix) The function $f(x) = x/\left(x^2 - 9\right)$ cannot be defined when $x =$

a) 3, 1 b) – 3, 1

c) 3, – 3 d) 9, – 9.

x) If $\frac{a}{b} = \frac{c}{d}$, then each of the ratio is equal to

a) $\frac{a+c}{b+d}$ b) $\frac{a-d}{b-c}$

c) $\frac{\pm a \pm c}{\pm b \pm d}$ d) none of these.

xi) If α and β are the roots of the equation $x^2 - 2x + 1 = 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

a) – 2 b) 0

c) 1 d) 2.

xii) The value of x for which the equation $2^x = 3^{-x}$ is satisfied, is

a) 1 b) 0

c) – 1 d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Show that the two circles $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g^{l}x + 2f^{l}y = 0$ will touch each other if $f^{l}g = g^{l}f$.

3. In how many ways can 12 examination papers be arranged so that the best and the worst papers may not come together ?

4. The 10th term of an A.P. is 15 and 16th term is 45, find the 30th term.

5. If $\log\left(\frac{a-b}{3}\right) = \frac{1}{2}(\log a + \log b)$, then show that $a^2 + b^2 = 11ab$.

6. Prove that :

$(A \cup B) - (A \cap B) = (A - B) \cup (B - A)$.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) A man can buy a flat for Rs. 1,00,000 cash or for Rs. 50,000 down and Rs. 60,000 at the end of the year. If money is worth 10% per year compounds half yearly, which plan should be choosen ?

b) If $x = \frac{\sqrt{a+b}+\sqrt{a-b}}{\sqrt{a+b}-\sqrt{a-b}}$ then show that $bx^2 - 2ax + b = 0$.

c) Prove that

$\log (1 + 2 + 3) = \log 1 + \log 2 + \log 3$.

8. a) How many ways can the letters of the word VOWEL be arranged ?

i) How many of these begin with V ?

ii) How many begin with V and do not end with L ?

b) A moving straight line always passes through the point (h, k). Prove that the locus of the middle point of the portion of the straight line intercepted between the axes of coordinates is $\frac{h}{x} + \frac{k}{y} = 2$.

c) For $\Omega = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9 \}$; $A = \{ 2, 3, 5, 7 \}$; $B = \{ 2, 3, 4, 5, 6 \}$; $C = \{ 2, 4, 6, 8 \}$, verify the following results :

i) $A - (B \cup C) = (A - B) \cap (A - C)$

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

iii) $(A \cap B)^c = (A^c \cup B^c)$.

9. a) For what of value of x, $3x^2+6x+7$ is least ? Also find the least value of this expression.

b) Find the equation of the straight line passing through the intersection of $2x - 3y + 4 = 0$ & $3x + 4y - 5 = 0$, and is perpendicular to the line $6x - 7y + 8 = 0$.

c) If $(3x - 2y) : (3x + 2y) = 4 : 5$, then what is the value of $x : y$?

10. a) If $a^x = b^y = c^z$ and $b^2 = ac$, prove that $\frac{1}{x}+\frac{1}{z}=\frac{2}{y}$.

b) The expenses of boarding house are partly fixed and partly variable with the number of boarders. The expenses are Rs. 700 per head when there are 25 boarders and Rs. 600 per head when there are 50 boarders. Find the expenses per head when there are 100 boarders.

c) In a cricket team of 14 players, there are 6 bowlers. How many different teams of 11 players can be formed taking at least 4 bowlers in the team ?

11. a) Find the sum to n terms :

$0{\cdot}7 + 0{\cdot}77 + 0{\cdot}777 + \ldots\ldots$.

b) If $f(x) = \frac{|x|}{x}$, $x \neq 0$ and c be a non-zero real number, show that $|f(c) - f(-c)| = 2$.

c) If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P. and $a + b + c \neq 0$, then show that $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ are also in A.P.