

Invigilator's Signature :
CS /BBA(H),BIRM,BSCM/SEM-1 /BBA-102 / 2009-10 2009

MATHEMATICS - I
Time Allotted : 3 Hours

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 <br> ( Multiple Choice Type Questions )

1. Choose the correct alternatives for any ten of the following :

$$
10 \times 1=10
$$

i) The co-ordinates of the centroid of the triangle whose vertices are ( 2,0$),(1,-3),(-3,3)$ is
a) (2,1)
b) (0,0)
c) (-1,3)
d) (2, 4 ).
ii) If $a x^{2}+b x+c=0(a \neq 0)$ then the sum of its roots will be
a) $-\frac{b}{a}$
b) $\frac{c}{a}$
c) $\frac{a}{b}$
d) $\frac{b}{a}$
a) 100
b) 110
c) 120
d) 90 .
iv) The sum of the binomial coefficients
$C_{0}+C_{1}+C_{2}+\ldots \ldots \ldots \ldots+C_{n}$ is
a) 2
b) $2^{n}$
c) $2^{n-1}$
d) none of these.
v) Let the function $f: R \rightarrow R$ defined by

$$
\begin{aligned}
f(x) & =2 x-1 \text { for } x>2 \\
& =x^{2}-1 \text { for }-2 \leq x \leq 2 \\
& =3 x+1 \text { for } x<-2 .
\end{aligned}
$$

then the value of $f(-3)$ is
a) 3
b) -8
c) 5
d) none of these.
vi) 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.
vii) The sequence $\{1,3,5,7$ $\qquad$ \} forms an A.P. Which of the following is true ?
a) Common difference $=2$
b) Common difference $=3$
c) Common difference $=1$
d) Common difference $=4$.
viii) The value of $\log _{2} 2$
a) 1
b) 0
c) 2
d) $\quad 2^{2}$.
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ix) If $\alpha$ and $\beta$ are the roots of the equation $x^{2}-2 x+1=0$, then the value of $\frac{1}{\alpha}+\frac{1}{\beta}$ is
a) -2
b) 0
c) 1
d) 2 .
x) If the roots of the equation $a x^{2}+b x+c=0,(a \neq 0)$ are real and equal, then its discriminant satisfies
a) $\quad D>0$ and $D=$ a perfect square
b) $\quad D=0$
c) $\quad D>0$ and $D \neq$ a perfect square
d) $D<0$.
xi) The sum of the first $n$ terms of an A.P. series
$\{1,2,3,4,5$, \} is
a) $\frac{n}{2}$
b) $\frac{n+1}{2}$
c) $\frac{n(n+1)}{2}$
d) $\frac{n(n-1)}{2}$.
xii) If $f(x+1)=2 x+3$, then $f(-3)$ is
a) 5
b) 3
c) 7
d) -5 .

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xiii) The co-ordinates of the middle point of the line joining the points $(2,3)$ and (3,2) is
a) $(2,2)$
b) $(2 \cdot 5,2 \cdot 5)$
c) $(3,3)$
d) none of these.

## GROUP - B

## ( Short Answer Type Guestions )

Answer any three of the following. $3 \times 5=15$
2. In how many ways can 12 examination papers be arranged so that the best and the worst papers may never come together?
3. Find the term independent of $x$ in the expansion of $\left(x^{2}+\frac{1}{x}\right)^{12}$.
4. The arithmetic mean of two numbers is 34 and their geometric mean is 16 . Find the numbers.
5. Show that the points (3, 0), (6, 4) and ( $-1,3$ ) are the vertices of a right-angled isosceles triangle.
6. The straight line $\frac{x}{a}+\frac{y}{b}=1$ is such that $a+b=10$. Find the locus of the middle point of that part of the line which is intercepted between the axes.

7. a) Find the angle between the straight lines $x-2 y+1=0$ and $x+3 y=2$.
b) Find the equation of the circle concentric to $x^{2}+y^{2}-4 x+6 y-13=0$ and passing through the point ( $-4,5$ ).
c) Show that the circle $x^{2}+y^{2}-6 x-8 y+23=0$ does not touch the straight line $4 x-7 y+28=0$.

$$
5+5+5
$$

8. a) In 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) Show that $1 /\left(\log _{a} a b c\right)+1 /\left(\log _{b} a b c\right)+1 /\left(\log _{c} a b c\right)=1$
c) A locomotive engine without a train can run $35 \mathrm{~km} /$ hour and its speed is diminished by a quantity which varies as the square root of the number of wagons attached. If with 16 wagons its speed is $15 \mathrm{~km} /$ hour, what is the least number of wagons that the engine will fail to move ? Find also the greatest number of wagons that the engine can move. $5+5+5$

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9. a) Prove that $C_{0}{ }^{2}+C_{1}{ }^{2}+C_{2}{ }^{2}+$ $\qquad$ $+C_{n}^{2}=\frac{(2 n) V}{(n!)^{2}}$ $a^{n}+(n+)^{2}$
b) If $\alpha, \beta$ be the roots of $a x^{2}+b x+c=0$, then form an equation whose roots are $\alpha / \beta$ and $\beta / \alpha$.
c) If $\alpha, \beta$ be the roots of the quation $2 x^{2}-3 x+4=0$, then find the value of $\alpha^{4}+\beta^{4}$. $5+5+5$
10. a) 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.
b) If $x$ is real, find the maximum value of $\frac{x+2}{2 x^{2}+3 x+6}$.
c) Solve for $x: 4^{x}-3.2^{x+2}+2^{5}=0$.
11. a) Let $\mathrm{U}=\{1,2,3,4,5,6,7,8,9,10\}$ be the universal set, $A=\{1,2,3,4,5,6\}$ and $B=\{5,6,7$,$\} . Then$ verify that $(A \cup B)^{C}=A^{C} \cap B^{C}$ and $A-B=A \cap B^{C}$.
b) If $a / 3=b / 4=c / 7$, then prove that $a+b=c$.
c) The sum of $n$ terms of an A.P. is $n^{2}$. Find the series. What is the common difference ? Which term is 59 ?

$$
5+5+5
$$

12. a) Find the square root of

$$
7+\sqrt{15}+\sqrt{18}+\sqrt{30}
$$

b) If $y=\frac{\sqrt{x+a}-\sqrt{x-a}}{\sqrt{x+a}+\sqrt{x-a}}$,
show that $y+\frac{1}{y}=\frac{2 x}{a}$.
$7+8$

