MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BBA(N)-102

BASICS OF MATHEMATICS

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: 1×10=10

(i) The value of $\log_{1/2} 64$ is

(a) 6 (b) – 6

(c) 1/6 (d) – 1/6

(ii) The term containing x^8 in $(1 + x^2)^{10}$ is

(a) 5th (b) 4th

(c) 6th (d) 7th

(iii) Slope of the line parallel to the line joining the points (2, 5) and (4, 3) is

(a) – 3 (b) 3

(c) 1/3 (d) – 1/3

(iv) Which of the following is a null set?

(a) {0} (b) $\{\varphi\}$

(c) $\{x : x \text{ is an integer and } 1 < x \leq 2\}$ (d) None of these

(v) 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

(vi) The mean proportion between p^3q and pq^3 is

(a) pq (b) p^2q^2

(c) $\pm p^2q^2$ (d) p^4q^4

(vii) If ${}^nC_2 = {}^nC_5$, then n is

(a) 2 (b) 5

(c) -5 (d) 7

(viii) The points (1, 2), (2, 4) and (x, 6) are collinear. Then x =

(a) 3 (b) 4

(c) 0 (d) -3

(ix) Sum of the first n natural numbers $1 + 2 + 3 + \cdots + n$ is

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

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

(x) 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

(xi) $y = x$ denotes a graph of a

(a) circle (b) straight line

(c) particular point (d) None of these

(xii) A function $f(x) = \frac{x}{x^2-9}$ cannot be defined when x is

(a) 3, 1 (b) –3, 1

(c) 3, –3 (d) 9, –9

Group – B

(Short Answer Type Questions)

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

2. A straight line passes through the point (2, 3) and the sum of its intercepts on X axis and Y axis is 10. Prove that the equation of the straight line is $x + y = 5$.

3. The cost price of 16 articles is equal to the selling price of 12 articles. What is the gain or loss percentage?

4. In how many ways can the letters of the word "BALLOON" be arranged, so that two O's do not come together?

5. A and B can do a piece of work in 12 days, B and C in 15 days, C and A in 20 days. How long would each take separately to do the same work?

6. Without using Venn Diagram prove
$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

Group – C
(Long Answer Type Questions)
Answer *any three* of the following questions. 15×3=45

7. (a) If α and β be the two non-zero roots of the equation $x^2 + qx + p = 0$, find the equation whose roots are $\frac{1}{\alpha+\beta}$ and $\frac{1}{\alpha} + \frac{1}{\beta}$.

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

(c) In a class of 50 students, 15 read Physics, 20 read Chemistry and 20 read Mathematics, 3 read Physics and Chemistry, 6 read Chemistry and Mathematics and 5read Physics and Mathematics and 7 read none of the subject. How many students read all the subjects? 5+5+5=15

8. (a) Divide 21 into three parts, which will be in A.P., such that the product of the first and second parts is 28.

(b) If $f(x) = \frac{1-x}{1+x}$, then find $f\left\{f\left(\frac{1}{x}\right)\right\}$.

(c) Show that $2 + \sqrt{17}$ is not a rational number. 5+5+5=15

9. (a) In a G.P. pth, qth and rth terms are respectively a, b, c. Show that $a^{q-r} b^{r-p} c^{p-q} = 1$.

(b) If $x^2 + y^2 = 14xy$, then prove that $2 \log \frac{x+y}{4} = \log x + \log y$.

(c) If $\frac{x}{y+z} = \frac{y}{z+x} = \frac{z}{x+y}$, then show that $x + y + z = 0$ or each fraction = 1/2. 5+5+5=15

10. (a) What is the present value of Rs. 4,000 due in 2 years at 5% compounded interest according as the interest is paid (i) yearly (ii) half-yearly.

(b) Prove that $\frac{1}{4.7} + \frac{1}{7.10} + \frac{1}{10.13} + \cdots + \frac{1}{(3n+1).(3n+4)} = \frac{n}{4.(3n+4)}$.

(c) Solve $2^{x+2} + 2^{x-1} = 9$. 5+5+5=15

11. (a) Find the locus of the point, the ratio of whose distances from the line $x = 2$ and from the point $(5, -1)$ is 3 : 2.

(b) State De Morgan's Laws. If $U = \{-1, -2, 0, 3, 5, 10, 12, 13, 16\}$, $P = \{-2, 3, 5, 12\}$, $Q = \{-1, -2, 0, 5, 12, 13\}$, then verify De Morgan's Laws.

(c) The base of a triangular field is three times of its height. If the cost of cultivating the field at Rs. 36.72 per hectare is Rs. 495.72, then find base and height. 5+5+5=15