

### MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code: BBAN-102

PUID: 01299 (To be mentioned in the main answer script)

#### 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:  $10 \times 1 = 10$ 
  - i) If A and B are two disjoint sets then

a) 
$$\{A \cap B\} = \{A\}$$

b) 
$$\{A \cap B\} = \{B\}$$

c) 
$$\{A \cap B\} = \{U\}$$

d) 
$$\{A \cap B\} = \{\phi\}.$$

by their usual meaning.

\*\*-1206/1(N)

Turn over

- ii) If  $ax^2 bx c = 0$  then the sum of the roots of the equation will be
  - a) -b/a

b) c/a

c) b/a

- d) -c/a.
- iii) The value of y for which the equation  $4^y = 5^{-y}$  is satisfied is
  - a) 1

b) (

c)  $\cdot$  -1

- d) none of these.
- iv) If f(x+1) = 3x-4, then f(-2) is
  - a) -6

(b) -7

c) -8

- d) -9.
- v) The number of subsets of a set with n elements is
  - a) 2n

b)\_2"

c)  $2^{n}-1$ 

- d) 2 n-1
- vi) The mean proportion between  $p^5q$  and  $pq^5$  is
  - a) pq

b)  $p^2q^2$ 

c)  $p^3q^3$ 

d)  $p^4q^4$ 

\* \*-1206/1(N)

2

- vii) If set  $A : \{ 1, 2, 3, 4 \}$  and set  $B : \{ 3, 4, 5, 8, 12 \}$ , then  $A \cup B$  is
  - a) {1,2,3,4,3,4,5,8,12}
  - b) {1, 2, 3, 4, 5, 8, 12}
  - 9 (3,4)
  - d) {1, 2, 5, 8, 12}

viii) The value of  $^{n+1}C_{r+1}$ 

- a)  ${}^nC_r + {}^{n+1}C_r$
- b)  ${}^{n}C_{r+1} + {}^{n+1}C_{r}$
- c)  ${}^nC_r + {}^nC_{r+1}$
- d)  ${}^{n}C_{r} + {}^{n+1}C_{r-1}$ .

ix) The value of  $\left(\frac{1}{81}\right)^4$  is equal to

a) 3

b) 21

c) 27

d) . 9.

x) The sum of the first n terms of an A.P. series

$$\{1, 2, 3, 4, 5, 6, 7, \dots, n\}$$
 is

a) n/2

- b) (n+1)/2
- c) n(n+1)/2
- d) n(n-1)/2.

\*\*-1206/1(N)

.3

| Turn over

- The co-ordinate of the middle point of the line joining the points (2, -3) and (4, 1) is
  - (2, 2)

b) (3,-1).

- (2, -2)
- d) (3, 1).
- xii) The distance between the two points (-2, 5) and (2,2) is
  - a) 1

c) 5

25. d)

#### GROUP - B

(Short Answer Type Questions)

Answer any three of the following.  $3 \times 5 = 15$ 

- Find the square root of 29 +  $12\sqrt{5}$ .
- If the roots of the equation  $x^2 4x + 3 = 0$  are  $\alpha, \beta$  then 3. find the equation whose roots are  $\frac{2}{\alpha}$ ,  $\frac{2}{\beta}$ .

4. If 
$$f(x+3) = 2x^2 - 3x - 1$$
, find  $f(x+1)$ .

Hence find f(0).

\* **\***-1206/1(N)

- 5. In how many ways the letters of the word TECHNICAL, can be arranged so that the vowels will never be separated?
- 6. Find the sum of 6 + 66 + 666 + 6666 + .... up to nth term.

# GROUP - C ( Long Answer Type Questions )

Answer any three of the following.  $3 \times 15 = 45$ 7. a) If the distance between the points P(-3, 3) and Q(4, K) be  $5\sqrt{2}$  units, find the co-ordinate of Q.

b) In a class of 50 students, 15 read economics,

22 read statistics and 20 read mathematics, 3 read

both economics and statistics, 6 read statistics and

mathematics and 5 read economics and

mathematics. 4 read none of the subjects. How

many students read all the subjects?

Solve for 
$$x: \sqrt{4x-9} + \sqrt{4x+9} = 5 + \sqrt{7}$$
.  $5 + 5 + 5$ 

\* \*-1206/1(N)

5

| Turn over

8. a) If 
$$f(x) = \frac{x^2 - 1}{x^2 + 1}$$
, find  $f\left\{f\left(\frac{1}{x}\right)\right\}$ .

b) If 
$$(a^2+b^2+c^2)(x^2+y^2+z^2) = (ax+by+cz)^2$$
, show that  $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$ .

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?

$$5 + 5 + 5$$

- 9. a) Prove that  $5+\sqrt{13}$  is not a rational number.
  - Find the area of the triangle whose vertices are A(0,0), B(0,5), C(5,0).
  - Without using Venn Diagram prove that for any three sets A, B, C

$$A - (B \cup C) = (A - B) \cap (A - C).$$
 6 + 3 + 6

- 10. a) Solve for x when  $4^{x+2} = 2^{2x+3} + 2$ 
  - b) A man can buy a flat for Rs. 1,00,000 cash or Rs. 50,000 down and Rs. 60,000 at the end of one year. If money is worth 10% per year compounded half yearly, which plan should be chosen?
  - c) The sum up to n terms of an A.P. is  $n^2$ . Find the common difference. Which term is 57? 5+5+5

11. a) If 
$$x = \log_a bc$$
,  $y = \log_b ca$ ,  $z = \log_c ab$ 

prove that  $\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1} = 1$ .

- b) A train is going at 1/3 of its usual speed and it takes an extra 30 minutes to reach its destination. Find its usual time to cover the same distance.
- c) If  $x^2 6x + a = 0$  has two roots  $\alpha$ ,  $\beta$  and  $3\alpha + 2\beta = 20$ , then find the value of a. 6 + 4 + 5