Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/BBA (H), BIRM, BSCM/SEM-1/BBA-102/2010-11

2010-11

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 × 1 = 10

   i)   The value of $\log_3^{27}$ is

       a)   5   b)   3

       c)   4   d)   2.

   ii)   If $P(n) = n^2 - n + 41, \forall\, n \in \mathbb{N}$ then $P(n)$ is

       a)   an even number

       b)   a number divisible by 3

       c)   a prime number

       d)   a number divisible by 7.

1003   [Turn over

iii) If α and β are the roots of the equation $x^2 + 6x + 2 = 0$, then the value of $\alpha^2 + \beta^2$ is

    a)   32   b)   30

    c)   28   d)   2.

iv) If A and B are any two sets then $A \cap (A \cup B)^C =$

    a) Φ b) B^C

    c) A^C d) B.

v) If $A \propto B$, then

    a) $A^3 + B^2 \propto AB$ b) $A + B^2 \propto AB$

    c) $A + B \propto A^2 B$ d) $A^2 + B^2 \propto AB$.

vi) The slope of the straight line that is parallel to line joining the points (2, –1) and (0, 2) is

    a)   1   b) $\dfrac{1}{3}$

    c) $-\dfrac{1}{2}$ d) $\dfrac{1}{2}$.

vii) The term, which is independent of x, is the expansion of $\left(x - \dfrac{3}{x} \right)^7$ is

    a)   4   b)   – 3

    c)   0   d)   3.

viii) The number of subsets of a set with n elements is

    a) $2n$ b) 2^n

    c) $\dfrac{n}{2}$ d) n^2.

ix) The function $f(x) = x^2 - 2x + 2$ is a

    a)   Even function

    b)   Odd function

    c)   Both (a) & (b)

    d)   Neither (a) nor (b).

x) π is a/an

    a)   natural number

    b)   rational number

    c)   irrational number

    d)   complex number.

xi) The number of ways in which 4 letters can be ported in 5 letter boxes is

    a) 4^5 b) $^5P_4$

    c) 5^4 d) $^5C_4$.

xii) The coordinates 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).

GROUP – B

(Short Answer Type Questions)

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

2. If $x \propto y + z$, $y \propto z + x$ and $z \propto x + y$, then prove that

   $$\frac{k}{k+1} + \frac{l}{l+1} + \frac{m}{m+1} = 1,$$ where k, l, m are the constants of

   variation.

3. Find the equation of the locus of a point such that the

   difference of its distances from the points (5, 0) and (– 5, 0)

   is always 5 units.

4. Without using Venn Diagram prove that

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

5. Show that $7 \log\left(\dfrac{10}{9}\right) - 2 \log\left(\dfrac{25}{24}\right) + 3 \log\left(\dfrac{81}{80}\right) = \log 2.$

6. In how many ways can the letters of the word "BALLOON" be

   arranged, so that two 'O's do not come together ?

GROUP – C

(Long Answer Type Questions)

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

7. a) If α and β are the roots of the equation $2x^2 - 4x + 1 = 0$, then form such an equation, whose roots are $\alpha^2 + \beta$ and $\beta^2 + \alpha$.

    b) Show that $\dfrac{1}{1 + \log_x^{yz}} + \dfrac{1}{1 + \log_y^{xz}} + \dfrac{1}{1 + \log_z^{xy}} = 1$.

    c) Find the sum of series

      1.2 + 2.3 + 3.4 + ... + upto n terms.

8. 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) If the coefficient of x^3 in the expansion of $\left(x^2 + \dfrac{k}{x} \right)^6$ be 160, find the value of k.

    c) Find the equation of the circle through the points (4, 3) and (– 2, 5) and having its centre on the line $2x - 3y = 4$.

9. a) What is the present value of Rs. 1,000 due in 2 years at

    5% compound interest according as the interest is paid

    i) yearly

    ii) half-yearly.

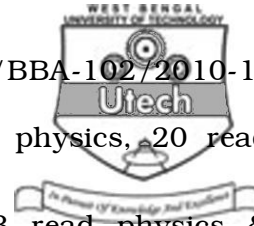   b) Apply the principle of mathematical induction to prove,
    $$\frac{1}{4.7} + \frac{1}{7.10} + \frac{1}{10.13} + ... + \frac{1}{(3n+1).(3n+4)} = \frac{n}{4(3n+4)}.$$

    c) Solve for x : $2^{x+2} + 2^{x-1} = 9$

10. a) Find the sum of the series 5 + 55 + 555 + ... + upto n

    terms.

    b) Find the square root of $12 - \sqrt{68 + 48\sqrt{2}}$.

    c) Prove that the three points (– 2, – 2), (2, 2) and

    $\left(-2\sqrt{3},\ 2\sqrt{3}\right)$ are vertices of equilateral triangle. Find the

    area of triangle.

11. a) In a class of 50 students 15 read physics, 20 read chemistry, 20 read mathematics, 3 read physics & chemistry, 6 read chemistry & mathematics and 5 read physics & mathematics. 7 read none of the subject. How many students read all the subjects ?

b) Find the total number of arrangements of the letters of the word "STATISTICS" when

i) there is no restriction

ii) the vowels remain together

iii) order of the vowels remain unchanged.

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