MANAVA BHARATI
INDIA INTERNATIONAL SCHOOL

MID-TERM EXAMINATION (2017-18)
SUBJECT: MATHEMATICS
CLASS: XI

TIME - 3 HOURS

MAXIMUM MARKS - 80

General Instructions

(i) Q.NO 1 to 6 carry 1 mark each.
(ii) Q.NO 7 to 12 carry 2 marks each.
(iii) Q.N 13 to 20 carry 4 marks each.
(iv) Q.NO 21 to 25 carry 6 marks each.

1. Let A = {x, y, z}, B = {1, 2}, Find the number of relation from A to B.

2. The Cartesian product AXA has 9 elements among which are found (-1,0) and (o ,1). Find the Set A and the remaining element of AXA.

3. A = { 1,2,3,4,5,6}, B = {2,4,6,8}, Find A - B and B - A

4. Find the value of Sin (- $\frac{11\pi}{3}$)

5. (i) 2SinA Sin B = ... (ii) 1 - Cos A = ...

6. (i) CosC + CosD = ... (ii) 1 + Cos2A = ...

7. Find the degree measure of the angle subtended at the centre of a circle of radius 100 cm by an arc of the length 22 cm (Use π = 22/7)

8. Find the domain and range of the real function f(x) = $\sqrt{x-1}$

9. Draw the graph of f(x) = |x - 1|. Find the domain and range of the function.

10. Solve the inequalities for real x, $\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

11. If the sum of a certain number of terms of the A.P. 25, 22, 19,.....is 116. Find the last term.

12. If A.M. and G.M. of two positive numbers a and b are 10 and 8, respectively, find the numbers.

13. Let S be the sum , P the product and R the sum of reciprocals of n terms in a G.P. Prove that
$P^2 R^n = S^n$

OR

If a and b are the roots of $x^2 - 3x + p = 0$ and c, d are roots of $x^2 - 12x + q = 0$, where A, b, c, d form a G.P. prove that (q + P): (q - p) = 17: 15,

14 (a) Prove that $\frac{Sinx - Sin3x}{Sin^2x - Cos^2x} = 2Sin\ x$

(b) Prove that $(Cos\ x + Cos\ y)^2 + (Sin\ x - sin\ y)^2 = 4\ Cos^2\frac{x+y}{2}$

15. Prove by using the principle of mathematical Induction
$1.2 + 2.2^2 + 3.2^3 + \ldots\ldots\ldots\ldots + n.\,2^n = (n-1)\,2^{n+1} + 2$

OR

$$1 + \frac{1}{(1+2)} + \frac{1}{(1+2+3)} + \ldots\ldots\ldots\ldots\ldots\ldots + \frac{1}{(1+2+3+\cdots\ldots\ldots\ldots+n)} = \frac{2n}{n+1}$$

16. If $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the A.M. between a and b ,then find the value of n .

17. (a) Find the principal and general solutions of the equation , $\text{Cosec}\, x = -2$
(b) Solve $2\cos^2 x + 3 \sin x = 0$

18. Prove that, $1^2 + 2^2 + 3^2 + \ldots\ldots\ldots\ldots\ldots\ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$

OR

Find the sum to n terms of the series
$1^2 + (1^2+2^2) + (1^2 + 2^2 + 3^2) + \ldots\ldots\ldots\ldots$

19. $\cos x = -\frac{1}{3}$, x in quadrant III , find $\sin\frac{x}{2}$, $\cos\frac{x}{2}$, and $\tan\frac{x}{2}$

20. (a) Find all pairs of consecutive even positive integers , both of which are larger than 5 such that their sum is less than 23.

(b) Is it true that for any sets A and B , $P(A) \cup P(B) = P(A \cup B)$? Justify your answer with example.

21. Show that, $\frac{1\times2^2 + 2\times3^2 + \ldots\ldots\ldots\ldots + n\times(n+1)^2}{1^2\times2 + 2^2\times3 + \cdots\ldots\ldots\ldots + n^2\times(n+1)} = \frac{3n+5}{3n+1}$

OR

Find the sum to n terms of the series, $.6 + .66 + .666 + \ldots\ldots\ldots\ldots\ldots\ldots$

22. Prove that, $\cos^2 x + \cos^2(x + \frac{\pi}{3}) + \cos^2(x - \frac{\pi}{3}) = \frac{3}{2}$

23. Prove by using the principle of Mathematical Induction,
$n(n+1)(n+5)$ is a multiple of 3

OR

Prove by using the principle of mathematical induction,
$3^{2n+2} - 8n - 9$ is divisible by 8 .

24. (a) Find the domain and range of the function, $f(x) = \sqrt{9 - x^2}$

(b) Let $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a function from Z to Z defined by $f(x) = ax + b$, for some integers a ,b. Determine a, b.

25. (a) In a survey of 60 people , it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T , 8 read both T and I, 3 read all three newspapers. Find the number of people who read at least one of the newspapers.

(b) Prove that, $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} = 0.$