MATHEMATICS TEACHERS ASSOCIATION MALAPPURAM (MAM)

MATHEMATICS TEST SERIES – II
MAY 2022

CLASS : XI **Time : 2 Hrs**
Max. score : 60 **Cool off time : 15 min**

(Complex Numbers and Quadratic Equations, Linear Inequalities, Permutations and Combinations & Binomial Theorem)

General Instructions to Candidates :

- There is a 'cool-off time' of 15 minutes in addition to the writing time.
- Use the 'cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination.

വിദ്യാർത്ഥികൾക്കുള്ള പൊതു നിർദേശങ്ങൾ :

- നിർദിഷ്ട സമയത്തിനു പുറമെ 15 മിനുറ്റ് "കൂൾ ഓഫ് ടൈം " ഉണ്ടായിരിക്കും
- ഉത്തരങ്ങൾ എഴുതുന്നതിനു മുൻപ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവം വായിക്കണം
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം എഴുതണം.
- കണക്കു കൂട്ടലുകൾ , ചിത്രങ്ങൾ , ഗ്രാഫുകൾ എന്നിവ ഉത്തരപ്പേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ആവശ്യമുള്ള സ്ഥലത്തു സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാല്ലുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും ഉപയോഗിക്കാൻ പാടില്ല.

1. (a) $i^3 =$ ..... (1)
   (b) Express $i^9 + i^{19}$ in the form of $a + ib$. (2)

2. (a) The conjugate of the complex number $z = 3 + 4i$ is ..... (1)
   (i) $3 + 4i$ (ii) $3 - 4i$
   (iii) $-3 + 4i$ (iv) $-3 - 4i$
   (b) Find the multiplicative inverse of the complex number $3 + 4i$ (2)

3. (a) Which among the following inequality represents the
   interval $[2, \infty)$? (1)
   (i) $x - 3 \geq 5, x \in R$ (ii) $13x - 3 \geq 5, x \in R$
   (iii) $3x - 1 \geq 3, x \in R$ (iv)$3x - 1 \geq 5, x \in R$
   (b) Ravi obtained 70 and 75 marks in first two unit tests. Find the
   minimum marks he should get in the 3rd test to have an
   average of atleast 60 marks. (2)

4. Find all pairs of consecutive even positive integers, both of which
   are larger than 5 , such that their sum is less than 23. (3)

5. (a) If $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$, then x is ...... (1)
   (i) 32 (ii) 16
   (iii) 64 (iv) 8
   (b) How many three digit numbers can be formed using the digits
   1,2,3,4,5,6 if the digits cannot be repeated. (2)

6. (a) $5! - 3! =$ ..... (1)
   (b) If $^nC_8 = {}^nC_9$, then find $^nC_{17}$. (2)

7. Expand $\left(x + \frac{1}{x}\right)^6$ using Binomial theorem. (3)

8. Find the middle term in the expansion of $\left(x + \frac{2}{x^2}\right)^6$ (3)

(Answer any SIX, each question carries 4 marks)

9. Consider the complex number $z = \frac{1+3i}{1-2i}$

    (a) Express z in the form $a + ib$ (2)

    (b) Represent z in the polar form.   (2)

10. (a) If $x + iy = \frac{a+ib}{a-ib}$, then prove that $x^2 + y^2 = 1$ (2)

    (b) Solve : $\sqrt{5}x^2 + x + \sqrt{5} = 0$ (2)

11. (a) Solve the inequality $\frac{3x-4}{2} \geq \frac{x+1}{3}$ (3)

    (b) Show the graph of the solution of (a) part in a number line.   (1)

12. Solve the following system of linear inequalities graphically.   (4)
    $$x + 2y \leq 8$$
    $$2x + y \leq 8$$
    $$x \geq 0, y \geq 0$$

13. (a) Find the number of arrangements of the letters of the word
    'CHEMISTRY' using each letter exactly once

    (i) If all letters are used at a time   (1)

    (ii) How many arrangements of part (i) start with C and end in Y. (1)

    (b) A group consist of 4 girls and 7 boys. In how many ways, can a
    team of 3 girls and 4 boys be selected.   (2)

14. (a) How many chords can be drawn through 21 points on a circle? (1)

    (b) Find n, if $^{2n}C_3 : {}^{n}C_3 = 12 : 1$ (3)

15. (a) Find $(a + b)^4 - (a - b)^4$ (2)

    (b) Hence evaluate $\left(\sqrt{3} + \sqrt{2}\right)^4 - \left(\sqrt{3} - \sqrt{2}\right)^4$ (2)

16. Consider the expansion of $\left(x + \frac{1}{x}\right)^{10}$

    (a) Write the general term of the above expansion.   (2)

    (b) Find the term independent of x in the above expansion.   (2)

(Answer any THREE, each question carries 6 marks)

17. **(a)** Represent the complex number $1 + i\sqrt{3}$ in the polar form.   (3)

    (b) Find the square root of the complex number $-7 - 24i$.   (3)

18. Solve the following system of linear inequalities graphically.   (6)

       $2x + y \geq 4$, $x + y \leq 3$, $2x - 3y \leq 6$

19. **(a)** Find the number of arrangements of the letters of the word
      INDEPENDENCE, in which all the vowels occur together?   (3)

    (b) How many words with or without meaning , each of 3 vowels
      and 2 consonants can be formed from the letters of the word
      INVOLUTE?   (3)

20. **(a)** Find the value of n, if $3 \times {}^{n}P_4 = 5 \times {}^{(n-1)}P_4$ (2)

    (b) What is the number of ways of choosing 4 cards from a pack
      of 52 playing cards?   (1)

      In how many of these

      (i) four cards are of the same suit   (1)

      (ii) four cards belong to four different suits   (1)

      (iii) two are red cards and two are black cards.   (1)

21. **(a)** Write the number of terms in the expansion of $(x + 2y)^9$ (1)

    (b) Find the coefficient of $x^6 y^3$ in the expansion of $(x + 2y)^9$ (2)

    (c) Find a if the 17th and 18th terms of the expansion $(2 + a)^{50}$ are

      equal.   (3)