NMTC PREVIOUS YEAR PAPER – 9 &10

PAPER - 2019

Q.1.- Q.15 – Objective – (1 Marks Each)

Q.15.- Q.30 – Subjective– (1 Marks Each)

GENERAL INSTRUCTIONS

Max Marks: 30

Time : 120 min

1) **Fill in the response sheet with your name, class, the institution through which you appear in the specified paper.**
2) **Diagrams are only visual aids; they are not drawn to scale.**
3) **You are free to do rough work on separate sheets.**
4) **Duration of the test: 2 pm to 4 pm – 2 hours.**

PART - A

Note:

- **Only one of the choices A, B, C and D is correct for each question. Shade that alphabets of your choice in response sheet (If you have doubt in the method of answering seek the guidance of your supervision)**
- **For each correct response you get 1 mark; for each incorrect response you lose ½ mark.**

1. The number of 6 digit numbers of the form "ABCABC", which are divisible by 13, where A, B and C are distinct digits, A and C being even digits is

(a) 200 (b) 250 (c) 160 (d) 128

2. In ΔABC, the median through B and C are perpendicular. Then $b^2 + c^2$ is equal to

(a) $2a^2$ (b) $3a^2$ (c) $4a^2$ (d) $5a^2$

3. In a quadrilateral ABCD, AB = AD = 10, BD = 12, CB = CD = 13. Then

(a) ABCD is a cyclic quadrilateral

(b) ABCD has an in-circle

(c) ABCD has both circum-circle and in-circle

(d) It has neither a circum-circle nor an in-circle

4. Given three cubes with integer side lengths, if the sum of the surface area of the three cubes is 498 sq. cm, then the sum of the volumes of the cubes in all possible solutions is

(a) 731 (b) 495

(c) 1226 (d) none of these

5. In a rhombus of side length 5, the length of one of the diagonals is at least 6, and the length of the other diagonal is at most 6. What is the maximum value of the sum of the diagonals?

(a) $10\sqrt{2}$ (b) 14 (c) $5\sqrt{6}$ (d) 12

6. In the sequence 1, 4, 8, 10, 16, 21, 25, 30 and 43, the number of blocks of consecutive terms whose sums are divisible by 11 is

(a) only one (b) exactly two

(c) exactly three (d) exactly four

7. Let A = {1, 2, 3, ….., 17}. For every nonempty subset B of A find the product of the reciprocals of the members of B. The sum of all such products is

(a) $\frac{153}{191}$ (b) $\frac{153}{\text{sum}(1, 2, \ldots\ldots, 17)}$

(c) 18 (d) 17

8. The remainder of $f(x) = x^{100} + x^{50} + x^{10} + x^2 - 6$ when divided by $x^2 - 1$ is

(a) $x + 1$ (b) -2 (c) 0 (d) 2

9. The number of acute angled triangles whose vertices are chosen from the vertices of a rectangular box is

(a) 6 (b) 8 (c) 12 (d) 24

10. In the subtraction below, what is the sum of the digits in the result?

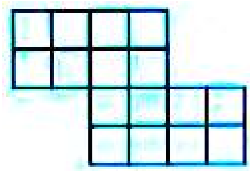
111……111 (100 digits) = 222…….222 (50 digits)

(a) 375 (b) 420 (c) 429 (d) 450

11. If m and n are positive integers such that $\frac{m+n}{m^2+mn+n^2} = \frac{4}{49}$, then m + n is equal to

(a) 4 (b) 8 (c) 12 (d) 16

12. Given a sheet of 16 stamps as shown, the number of ways of choosing three connected stamps (two adjacent stamps must have an edge in common) is



(a) 40 (b) 41 (c) 42 (d) 44

13. In an election 320 votes were cast for five candidates. The winner's margins over the other four candidates were 9, 13, 18 and 25. The lowest number of votes received by a candidate was

(a) 49 (b) 50 (c) 51 (d) 52

14. A competition has 25 questions and is marked as follows:

(A) Five marks are awarded for each correct answer to Questions 1 to 15

(B) Six marks are awarded for each correct answer to Questions 16 to 25

(C) Each incorrect answer to Questions 16 to 20 loses 1 mark

(D) Each incorrect answer to Questions 21 to 25 loses 2 marks

(a) 126 (b) 127 (c) 128 (d) 129

15. A, M, T, I are positive integers such that $A + M + T + I = 10$, The maximum possible value of $A \times M \times T \times I + A \times M \times T + A \times M \times I + A \times T \times I + M \times T \times I + A \times M + A \times T + A \times I + M \times T + M \times I + T \times I$ is

(a) 109 (b) 121 (c) 133 (d) 144

PART – B

Note:

- **Write the correct answer in the space provided in the response sheet.**
- **For each correct response you get 1 mark; for each incorrect response you lose ¼ mark.**

16. The three digit number XYZ when divided by 8, gives as quotient the two digit number ZX and remainder Y. The number XYZ is _____.

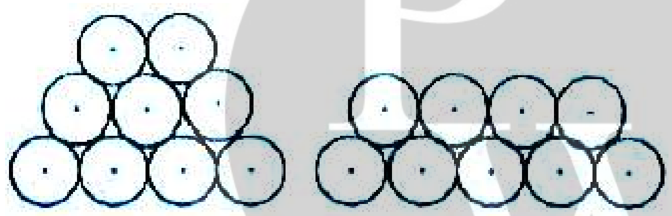
17. The digit sum of any number is the sum of its digits. N is a 3 digit number. When the digit sum of N is subtracted from N, we obtain the square of the digit sum of N. The number N is _____ .

18. A 4 × 4 anti-magic square in an arrangement of the numbers 1 to 16 in a square so that the totals of each of the four rows, four columns and the two diagonals are ten consecutive numbers in some order. The diagram shows an incomplete anti magic square. When is it completed, the number in the position of * is _____.

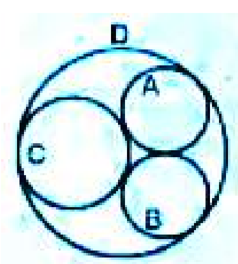
			14
*	9	3	7
	12	13	5
10	11	6	4

19. An escalator moves up at a constant rate. John walks up the escalator at the rate of one step per second and reaches the top in twenty seconds. The next John's rate was two steps per second, and he reached the top in sixteen seconds. The number of steps in the escalator is _____.

20. In a stack of coins, each now has exactly one coin less than the row below. If we have nine coins, two such towers are possible. Of these, the tower on the left is the tallest. If you have 2015 coins, the height of the tallest tower is ____.

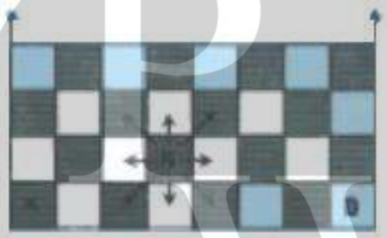


21. Circles A, B and C are externally tangent to each other and internally tangent to circle D. Circles A and B are congruent. Circle C has radius 1 unit and passes through the center of circle D. Then the radius of circle B is ____ units.

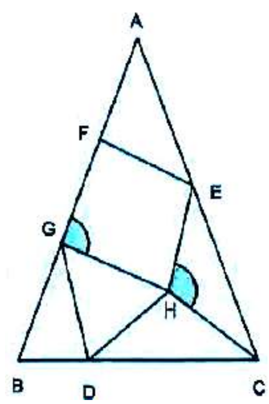


22. The number of different integers x that satisfy the equation $(x^2 - 5x + 5)^{(x^2 - 11x + 30)} = 1$ is ___.

23. In a single move a King K is allowed to move to any of the squares touching the square it is on, including diagonals, as indicated in the figure. The number of different paths using exactly seven moves to go from A to B is _____.



24. In ΔABC shown below, AB = AC; F is a point on AB and E a point on AC such that AF = EF. H is a point in the interior of ΔABC, D is a point on BC and G is a point on AB such that EH = CH = DH = GH = DG = BG. Also, $\angle CHE = \angle HGF$. The measure of $\angle BAC$ in degree is ___.



25. Let x and y be real numbers satisfying $x^4y^5 + y^4x^5 = 810$ and $x^3y^6 + y^3x^6 = 945$. Then the value of $2x^3 + x^3y^3 + 2y^3$ is _____.

26. The least odd prime factor of $2019^8 + 1$ is _____.

27. Let a, b, c be positive integers each less than 50, such that $a^2 - b^2 = 100c$. The number of such triples (a, b, c) is _____.

28. The number of non-negative integers which can be written in the form $b_4 . 3^4 + b_3 . 3^3 + b_2 . 3^2 + b_1 + 3^1 + b_0 . 3^0$, where $b, \in (-1, 0, 1)$ for $0 \leq i \leq 4$ is ___.

29. (a_k) is a sequence of integers, with $a_1 = -2$ and $a_{m+n} = a_m + a_n + mn$, for all positive integers m, n. Then the value of a_0 $^{-}$ _____.

30. The coefficient of x^{90} in $(1 + x + x^2 + x^3 + ….. + x^{60})(1 + x + x^2 + …. + x^{120})$ is equal to _____.