B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

TERM-1 EXAMINTION, 2025-26
MATHEMATICS

Class: XI	**Time: 3hr**
Date: 12/09/25	**Max Marks: 80**
Admission no:	**Roll no:**

General Instructions:
1. **This Question Paper has 5 Sections A, B, C, D and E.**
2. **Section A has 20 MCQs carrying 1 mark each**
3. **Section B has 5 questions carrying 02 marks each.**
4. **Section C has 6 questions carrying 03 marks each.**
5. **Section D has 4 questions carrying 05 marks each.**
6. **Section E has 3 case-based integrated units of assessment (04 marks each) with sub-parts.**
7. **All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks have been provided. An internal choice has been provided in the 2marks questions of Section E**
8. **Draw neat figures wherever required. Take π =22/7 wherever required if not stated.**

SECTION A

1. If A, B and C are any three sets, then $A \times (B \cup C)$ is equal to: 1m
   (a) $(A \times B) \cup (A \times C)$ (b) $(A \cup B) \times (A \cup C)$ (C) $(A \times B) \cap (A \times C)$ (d) none of these

2. The cardinality of the power set of $\{x: x \in N, x \le 10\}$ is _____.   1m
   (a) 1024   (b) 1023   (C) 2048   (d) none of these

3. If tan A = 1/2 and tan B = 1/3, then the value of (A + B) is   1m
   (a) $\pi/6$ (b) π (c) 0   (d) $\pi/4$

4. The value of sin 50° − sin 70° + sin 10° is equal to   1m
   (a) 1   (b) 0   (c) 1/2   (d) none of these

5. The domain of the function $f(x) = x / (x^2 + 3x + 2)$ is   1m
   (a) [-2, -1]   (b) R − {1, 2}   (c) R − {-1, -2}   (d) R − {2}

6. In a function from set A to set B, every element of set A has_____ image in set B.   1m
   (a) one and only one   (b) different   (c) many   (d) none of these

7. (x+3) + i(y-2) = 5+i2, find the values of x and y.   1m
   (a) x=8 and y=4   (b) x=2 and y=4   (c) x=2 and y=0   (d) x=8 and y=0

8. 0+0i is _____for complex number z.   1m
   (a) additive inverse   (b) additive identity element   (c)multiplicative identity element   (d)multiplicative inverse

9. If $-3x + 17 < -13$, then   1m
   (a) $x \in (10, \infty)$ (b) $x \in [10, \infty)$ (c) $x \in (-\infty, 10]$ (d) none of these

10. If $|x - 1| > 5$, then   1m

(a) x ∈ (– 4, 6)   (b) x ∈ [– 4, 6]   (c) x ∈ (– ∞, – 4)   (d) none of these
                                              U (6, ∞)

11. The range of $f(x) = \sqrt{(25 - x^2)}$ is   1m
    (a) (0,5)   (b) [0,5]   (c)(-5,5)   (d)[1,5]

12. The number of ways in which 8 students can be seated in a line is   1m
    (a) 5040   (b) 50400   (c) 40230   (d) 40320

13 The number of ways 10-digit numbers can be written using the digits 1 and 2 is   1m
    (a) 2^{10} (b)$^{10}C_2$ (c) 10!   (d) $^{10}C_1 + ^9C_2$

14 The coefficient of the middle term in the expansion of $(2+3x)^4$ is: 1m
    (a) 5!   (b) 6   (c) 216   (d) none of these

15 The coefficient of x^3y^4 in $(2x+3y^2)^5$ is   1m
    (a) 360   (b) 720   (c) 240   (d) none of these

16 The value of cos 1° cos 2° cos 3° … cos 179° is   1m
    (a) 1/√2   (b) 0   (c) 1   (d) none of these

17 Value of i^{-37} is   1m

    (a) 13/i   (b) 1/i   (c) 1   (d) none of these

18 There are 10 true-false questions in an examination. These questions can be   1m
   answered in:
    (a) 20 ways   (b) 100 ways   (c) 1024 ways   (d) none of these

19 Assertion (A):- The power set of {1, 2} is {∅,{1},{2},{1, 2}} .   1m
   Reason (R):- The power set is the set of all subsets.
   (a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct
   explanation of Assertion (A).
   (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct
   explanation of Assertion (A).
   (c) Assertion (A) is true and Reason (R) is false.
   (d) Assertion (A) is false and Reason (R) is true.

20 Assertion (A): If the letters W, I, F, E are arranged in a row in all possible ways and   1m
   the words (with or without meaning) so formed are written as in a dictionary, then
   the word WIFE occurs in the 24th position.
   Reason (R): The number of ways of arranging four distinct objects taken all at a time
   is C (4, 4).
   (a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct
   explanation of Assertion (A).
   (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct
   explanation of Assertion (A).
   (c) Assertion (A) is true and Reason (R) is false.
   (d) Assertion (A) is false and Reason (R) is true.

SECTION B

21 Given L = {1,2, 3,4}, M= {3,4, 5, 6} and N= {1,3,5}   2m
   Verify that L - (M ∪ N) = (L - M) ∩ (L - N)

OR

Given that N= {1,2,3, …, 100}. Then write
(i) the subset of N whose elements are even numbers.
(ii) the subset of N whose element are perfect square numbers.

22.   Prove that :$\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$ 2m

23   Find the modulus of the following complex numbers: 2m
(i) 3+4i
(ii) 1−i

24   Ravi scored 70 and 75 in two-unit tests. Find the minimum marks he must score in   2m
the third test to achieve an average of at least 60.

OR

Solve the inequalities:

(a) $5x - 3 < 7$

(b) $2 - 3x \geq 5$

25   Expand the expression $(x+a)^3$ using the Binomial Theorem.   2m

SECTION C

26   Let A, B and C be sets. Then show that A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C).   3m

27   Let the relation R be defined on the set {0,1,2,3,4,5} as: 3m
R = {(x, x+5): x∈ {0,1,2,3,4,5}}
Find the domain and range of the relation.

OR

Find the domain and range of the following functions:

(i) $f(x) = \sqrt{4 - x^2}$

(ii) $g(x) = \frac{1}{x-3}$

28   $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$ 3m

29   Express the following in the form a+ib: 3m
$$\frac{(3 + i\sqrt{5})(3 - i\sqrt{5})}{(\sqrt{3} + \sqrt{2}i) - (\sqrt{3} - \sqrt{2}i)}$$

30   From a class of 8 students (5 boys and 3 girls) a committee of 4 is to be chosen.   3m
(a) How many different committees of 4 can be formed?
(b) How many committees contain at least two girls?

31   Solve the following in equation: 3m

$$\frac{5x-2}{3} - \frac{7x-3}{5} > \frac{x}{4}.$$

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OR

Solve 5x-3< 3x+1 when (i) x is a real, (ii) x is integer number, (iii) x is a natural number.

SECTION D

32   Prove that: 5m

$$(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4\cos^2\left(\frac{x+y}{2}\right).$$

.

OR

Prove that: cot4x (sin5x+sin3x) = cotx (sin5x-sin3x)

33   Let X=3+4i and Y=1−2i.   5m
Answer the following:
(a) Find X+Y in the form a+ib.
(b) Find product of X and Y.
(c) Find the modulus and argument of X.
(d) Find the multiplicative inverse of Y.

Or

(a) Solve x^2- 2x +5 and write the roots in the form a + ib
(b) Find the modulus of each root.

34   Find: 5m
(a) The middle term(s) in the expansion of

$$\left(2x - \frac{3}{x}\right)^{10}$$

(b) The term independent of x.

35   The word 'MATHEMATICS' has 11 letters.   5m
(a) In how many distinct ways can all the letters be arranged?
(b) In how many ways can the letters be arranged if the vowels always come together?

SECTION E

36   A company makes two types of snack packs: Protein Pack (P) and Energy Pack (E).   4m
- Each Protein Pack requires 4 hours of labour and 3 kg of raw materials.
- Each Energy Pack requires 3 hours of labour and 6 kg of raw materials.
- The factory has 60 hours of labour and 72 kg of raw materials available per week.
- The company wants to produce at least 5 Protein Packs and at least 4 Energy Packs per week to meet customer demand.

Questions:
1. Write the inequality representing the labour constraint.
   Or
   Write the inequality representing the raw material constraint.
2. Write the inequalities for the minimum demand conditions.
3. Check whether the point (8, 6) lies inside the feasible region.

37 A Ferris wheel at an amusement park takes tourists on a full circular ride. The wheel   4m
    completes one full rotation in 40 seconds. An operator measures the rotation in
    radians per second, while the ride manager prefers degrees per second for
    announcements.
    Based on this scenario, answer the following questions:
    Data:
    - Time for one complete rotation: 40 seconds
    - One complete rotation = 2π radians = 360^0

    Questions:
    1. What is the angular speed of the Ferris wheel in radians per second?
    2. Convert the angular speed into degrees per second.
    3. How many radians will the wheel rotate in 15 seconds?
       Or
       How many degrees will the wheel rotate in 25 seconds?

38 To make himself Self dependent and to earn his living .A person decided to set up a   4m
    small-scale business of manufacturing sanitizers He estimated the cost of rupees
    15,000 fixed for every month and a cost of rupees 30 per unit as manufacturing cost.
    (a) If x units are manufactured per month. What is the cost function?
    (b) If each unit are sold for Rs.45. What is selling function?
    (c) What is the profit function?
                                    Or
    What is the profit per day in month of July, if 93 units are produced in that month?

                        *********BEST OF LUCK**********