Suguna International School
Gandhipuram
Pre-Annual Examination (December 2025)

MARKING SCHEME

SECTION - A

1. The domain and range of real function f defined by f (x) = $\sqrt{2-x}$ is given by

   d) Domain = (-∞, 2], Range = [0, ∞)

2. The range of the function f(x) = - 4 cos(2x - 3) is

   d) [-4 , 4]

3. If f(x) = x sin x, then f′(π/2) is equal to

   b) 1

4. Three numbers form an increasing GP. If the middle number is doubled, then the new numbers are in AP. The common ratio of the GP is

   b) 2+ $\sqrt{3}$

5. The number of words that can be formed using the letters of the word "ELECTION" such that it starts and ends with E:

   b) 6!

6. If P (1, 2), Q (3, 5), R (7, 9) form a triangle then find the equation of median through P.

   a) 5x-4y+3 = 0

7. The mean deviation of the data 2, 9, 9, 3, 6, 9, 4 from the mean is

   b) 2.57

8. The positive integer n so that $\lim_{x\to 2} \frac{x^n-2^n}{x-2} = 32$ is

   a) 4

9. An experiment involves rolling a pair of dice.

   The following events are recorded.

   P : The sum is greater than 9.

   Q : 1 occurs on either die.

   R : The sum is at least 8 and a multiple of 3.

   Which pair of these events is/are mutually exclusive?

   c) Both (a) and (b)

10. The number of ways 4 boys and 3 girls can be seated in a row so that they are alternate is

    c) 144

11. If $(1 - i)^2 = a + ib$, then the value of a and b are respectively

d) 0, 2

12. If S = {x | x is a positive multiple of 3 less than 100} and P = {x | x is a prime number less than 20}. Then, n(S) + n(P) is equal to

d) 41

13. The greatest coefficient in the expansion of $(1 + x)^{10}$ is _____.

b) $10!/(5!)^2$

14. The value of $\sin(45° + \theta) - \cos(45° - \theta)$ is

d) 0

15. M is the foot of the perpendicular drawn from the point A(6, 7, 8) on the yz-plane. What are the coordinates of point M?

c) (6, 0, 8)

16. The centre of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ is (a, b) then (2a + 3 b) is

a) 0

17. The derivative of $-cos\pi$ is _____.

c) 0

18. If Riya has x rupees and she pay 40 rupees to shopkeeper, then the range of x if amount of money left with her is at least 10 rupees is given by inequation

d) $x \geq 50$

19. **Assertion (A):** The sum of the infinite geometric series $1 + x + x^2 + x^3 + \ldots$ where $|x| < 1$ is: $\frac{1}{1-x}$

Reason (R): The sum of infinite GP is given by the formula: $S_n = \frac{1}{r-1}$, When $|r| < 1$.

C

20. **Assertion (A)** :The point (0, 7, 4) lies on the YZ-Plane

Reason (R): Any point on x-axis will be of the form (x, 0, 0)

B

SECTION – B

21. Find the sum of 8, 88, 888 upto n terms.

$$S_n = 8(1 + 11 + 111 + \ldots + n \text{ terms})$$

$$S_n = \frac{8}{9}((10 - 1) + (10^2 - 1) + (10^3 - 1) + \ldots + (10^n - 1))$$

$$S_n = \frac{8}{9}\left(\frac{10(10^n - 1)}{9} - n\right)$$

OR

If the fourth and the ninth terms of a G.P. are 54 and 13122 respectively, find the sixth term of the G.P.

$$\frac{ar^8}{ar^3} = \frac{13122}{54}$$

$$r = 3$$

The sixth term of the G.P. is **486**.

22. Find the equation of hyperbola satisfying given conditions foci $(\pm 5, 0)$ and transverse axis is of length 8.

Foci (±5, 0), the transverse axis is of length 8.

Here, the foci are on the x-axis.

Therefore, the equation of the hyperbola is of the form $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

Now, Foci are (±5, 0), c = 5.

Length of transverse axis 8, 2a = 8 = a = 4.

We know that $a^2 + b^2 = c^2$.

Therefore, $4^2 + b^2 = 5^2$

$b^2 = 25 - 16 = 9$

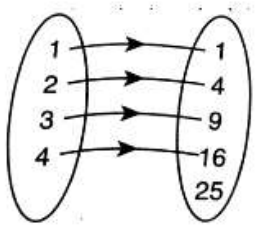
Thus, the equation of the hyperbola is = $\frac{x^2}{16} - \frac{y^2}{9} = 1$

23. Let $A = \{1,2,3,4\}$, $B = \{1,4,9,16,25\}$ and R be a relation defined from A to B as

$$R = \{(x, y): x \in A, y \in B \text{ and } y = x^2\}$$

(a) Depict this relation using arrow diagram. (b) Find domain of R. (c) Find range of R.

(i) Relation R = {(1, 1), (2, 4), (3, 9), (4, 16)}



(ii) Domain of R = {1, 2, 3, 4}

(iii) Range of = {1, 4,9, 16}

24. Find the point on y-axis which is at a distance of 10 units from the point (1, 2, 3).

$$10 = \sqrt{(1-0)^2 + (2-y)^2 + (3-0)^2}$$

25. Differentiate $\frac{x}{sinx}$ with respect to x.

$$\frac{\sin(x) - x \cdot \cos(x)}{\sin^2(x)}$$

$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{\frac{d}{dx}(f)\cdot g - f\cdot\frac{d}{dx}(g)}{g^2}$$

OR

Evaluate: $\lim_{x\to 0}\frac{\sqrt{2+x}-\sqrt{2}}{x}$

SECTION – C

26. Verify symmetric difference between sets A = {2,3,5,7,8} and B = {1,5, 6, 8. 9}

    Also represent the above set as a Venn diagram

27. If $(x + iy)^3 = u + iv$, then show that $u/x+v/y=4(x^2-y^2)$

$$(x+iy)^3 = x^3 + 3x^2(iy) + 3x(iy)^2 + (iy)^3$$

$$= x^3 - 3xy^2 + i(3x^2y - y^3)$$

- Real part: $u = x^3 - 3xy^2$

- Imaginary part: $v = 3x^2y - y^3$

$$\frac{u}{x} + \frac{v}{y} = \frac{x^3 - 3xy^2}{x} + \frac{3x^2y - y^3}{y}$$

$$= x^2 + 3xy - 4y^2$$

$$\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2).$$

OR

If $z_1\bar{z_2} = a + ib$. Find the value of $a^2 + b^2$ where $z_1 = 4 + 7i$ and $z_2 = 1 - i$.

28. Find the coefficients of x^4 in $(1 - x)^2 (2 + x)^4$ using binomial theorem.

OR

Expand and simplify: $\left(a^2 + \sqrt{a^2-1}\right)^4 - \left(a^2 - \sqrt{a^2-1}\right)^4$.

29. Find the **mean deviation** about the **median** for the following data.

Marks	0 - 10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	7	14	13	12	20	11	15	8

30. If P and Q are the points (−2,2,3) and (−1,4,−3) respectively, then find the locus of A such that 3|AP|=2|AQ|.

31. IQ of a person is given the formula = (MA/CA)×100 ; where MA is mental age and CA is chronological age. If 90 ≤ IQ ≤ 160 for a group of 12 year children, find the range of mental age

OR

Solve for 'x': $\frac{4}{x+1} \leq 3 \leq \frac{6}{x+1}$, $(x > 0)$

SECTION – D

32. A team of medical students doing their internship have to assist during surgeries at a city hospital. The probabilities of surgeries rated as very complex, complex, routine, simple or very simple are respectively, 0.15,0.20, 0.31, 0.26, .08. Find the probabilities that a particular surgery will be rated

    a) complex or very complex;

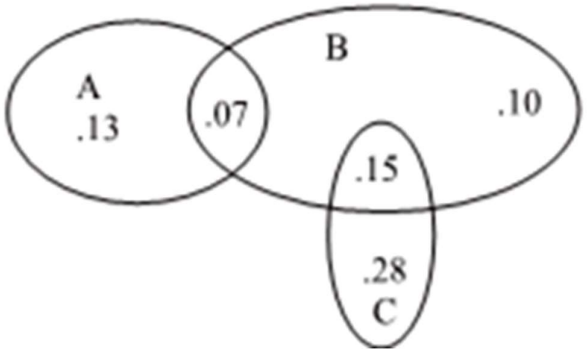
    b) neither very complex nor very simple;

    c) routine or complex

    d) routine or simple**.**

OR

33. The accompanying Venn diagram shows three events, A, B, and C, and also the probabilities of the various intersections (for instance, P(A∩B) = .07).



Find

a) P(A) b) $\boldsymbol{P(B \cap \bar{C})}$

c) P(A ∪ B) d) P(A ∩ B)

e) Probability that exactly one of the 3 occurs

34. a) Find the derivative of $cos(x)$ using the first principle.

    a) If $f(x) = \sqrt{2x^2 - 2} + 5\ secx$, find $f'(x)$

35. If p and q are the lengths of perpendiculars from the origin to the lines $x\cos\theta - y\sin\theta = k\cos2\theta$ and $x\sec\theta + y\operatorname{cosec}\theta = k$, respectively, prove that $p^2 + 4q^2 = k^2$

OR

Find the distance of the point (3, 2) from the straight line whose slope is 5 and is passing through the point of intersection of lines x + 2y = 5 and x – 3y + 5 = 0

36. a) If $tanx = \frac{3}{4}$ and x lies in the 3rd quadrant, find the value of $sin\frac{x}{2}, cos\frac{x}{2}$ and $tan\frac{x}{2}$

    b) Prove that $\frac{cos2B - cos2A}{sin2B + sin2} = \tan(A - B)$.

SECTION – E

Case-Study 1:

37. The students of class XI were given a task to arrange the letters of the word

'BACKGROUND' in all possible ways.

Based on the above information, answer the following questions:

i) In how many ways can all letters of the word BACKGROUND be arranged?

ii) In how many ways can all letters of the word BACKGROUND be arranged so that the positions of vowels and consonants are unaltered?

iii) In how many ways can all letters of the word BACKGROUND be arranged so that All vowels are occur together?

OR

iii) In how many ways can all letters of the word BACKGROUND be arranged so that all consonants are occur together?

Case-Study 2:

38. Arun is running in a racecourse note that the sum of the distances from the two flag posts from him is always 10 m and the distance between the flag posts is 8 m.

i. Which type of curve is represented by the path traced by Arun? Find the length of major axis? (1)

ii. Find the equation of the curve traced by Arun? (1)

iii. Find the eccentricity of path traced by Arun? (2)

OR

iii. Find the length of latus rectum for the path traced by Arun. (2)

Case-Study 3:

39. Relation is defined as a relationship between a non-empty set A to no-empty set B such that Relation from A to B is a subset of Cartesian Product of A and B i.e. $R \subseteq A \times B$. A relation from set A to set B is defined as function if all the elements of set A are related to at least one element of B and no two elements of B are related to a single element of A

a) If $R_1 = \{(x, y) | y = 2x + 7$, where $x \in R$ and $-5 \leq x \leq 5\}$ is a relation. Then find the domain and range of R_1

b) Let $f = \{(2,4), (5,6), (8, -1), (10, -3)\}$ and $g = \{(2, 5), (7,1), (8,4), (10,13), (11, 5)\}$ be two real functions. Then match the following:

Column-I		Column -II	
a)	f - g	i)	{(2, 4/5), (8, -1/4), (10, -3/13)}
b)	f + g	ii)	{(2, 20), (8, -4), (10, -39)}
c)	f x g	iii)	{(2, -1), (8, -5), (10, -16)}
d)	f / g	iv)	{(2, 9), (8, 3), (10, 10}