

BOARD OF INTERMEDIATE EDUCATION
SENIOR INTER MATHEMATICS PAPER - II (A)
MODEL PAPER (ENGLISH VERSION)

TIME: 3 HOURS

MAX.MARKS: 75

Note: This question paper consists of three sections A, B and C.

SECTION – A

I. i) Very Short Answer Type questions.

ii) Answer ALL questions.

ii) Each question carries TWO marks.

10 × 2 = 20

1. If $z = (\cos \theta, \sin \theta)$, find $z + \frac{1}{z}$ and $z - \frac{1}{z}$.
2. If $z = x + iy$ and $|z| = 1$, find the equation to the locus of z .
3. If $x = \text{cis } \theta$, find $x^6 + \frac{1}{x^6}$ and $x^6 - \frac{1}{x^6}$.
4. For what value of m , the equation $(2m + 1)x^2 + 2(m + 3)x + (m + 5) = 0$ will have equal roots?
5. Express the sum of the cubes of the roots of the equation $x^3 - px^2 + qx + r = 0$ in terms of p, q, r .
6. There are 5 and 7 elements in the sets A and B respectively. Find the number of injections from A to B.
7. Find the number of positive divisors of 1080.
8. Find the constant term in $\left(\left(\frac{x}{3}\right)^{1/2} + \frac{3}{2} \cdot x^{-2}\right)^{10}$.
9. The variance of 20 observations is 5. If each observation is multiplied with 2, find the variance of resulting observations.
10. Find the first two observations of the binomial distribution with mean 6 and variance 2.

SECTION – B

II. i) Short Answer Type questions.

ii) Answer any FIVE questions.

iii) Each question carries FOUR marks.

5 × 4 = 20

11. If $1, \omega, \omega^2$ are the cube roots of unity, prove that $(x + y + z)(x + y\omega + z\omega^2)(x + y\omega^2 + z\omega) = x^3 + y^3 + z^3 - 3xyz$.
12. If the expression $\frac{x - p}{x^2 - 3x + 2}$ takes all real values for $x \in \mathbb{R}$, then find the bounds for p .
13. Find the number of ways of arranging 8 gents and 4 ladies around a circular table. Find, of these, the number of ways that
 - (i) all ladies sit together
 - (ii) no two ladies sit together

14. Prove: $\frac{{}^{4n}C_{2n}}{{}^{2n}C_n} = \frac{1.3.5 \dots (4n-1)}{[1.3.5 \dots (2n-1)]^2}$

15. Resolve into partial fractions: $\frac{x^3}{(x-1)(x+2)}$

16. If P is a probability function, then show that for any two events A and B, $P(A \cap B) \leq P(A) \leq (A \cup B) \leq P(A) + P(B)$.

17. A, B are independent events such that $P(A) = 0.6$, $P(B) = 0.7$. Then find

- (i) $P(A \cap B)$ (ii) $P(A \cup B)$ (iii) $P(B/A)$ (iv) $P(A^C \cap B^C)$.

SECTION - C

III. i) Long Answer Type questions.

ii) Answer any FIVE questions.

iii) Each question carries SEVEN marks.

5 × 7 = 35

18. For a positive integer n, solve: $(x-1)^n = x^n$.

19. Find the repeated roots of the equation. $x^5 - 3x^4 - 5x^3 + 27x^2 - 32x + 12 = 0$

20. If |x| is so small that x^2 and higher powers of x may be neglected, then find the approximate value of

the expansion $\frac{(8+3x)^{2/3}}{(2+3x)\sqrt{4-5x}}$

21. If $x = \frac{1}{5} + \frac{1.3}{5.10} + \frac{1.3.5}{5.10.15} + \dots \infty$, find the value of $3x^2 + 6x$.

22. Find variance and S.D. of the following distribution.

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

23. Three urns have the following composition of balls:

Urn I	1 White	2 Black
Urn II	2 White	1 Black
Urn III	2 White	2 Black

One of the Urns is selected at random and a ball is drawn. It turns out to be White. Find the probability that it will come from Urn III.

24. A random variable X has the following probability distribution.:

$X = X_i$	0	1	2	3	4	5	6	7
$P(X = X_i)$	0	K	2K	2K	3K	K^2	$2K^2$	$K + 7K^2$

Find: (i) K (ii) mean (iii) $P(0 < x < 5)$.