

# T.S. Intermediate Board Mathematics IIA Model Paper

(Extracted from [tsbie.cgg.gov.in](http://tsbie.cgg.gov.in))

## Mathematics Paper - II(A)

Time : 3 Hours

Max. Marks : 75

### SECTION A

I. **Very Short Answer Type Questions :**

**10 × 2 = 20**

(i) Answer **ALL** questions.

(ii) Each question carries **TWO** marks.

1. If  $z_1 = (3, 5)$  and  $z_2 = (2, 6)$ , find  $z_1 \cdot z_2$ .
2. Find the multiplicative inverse of the complex number  $\sqrt{5} + 3i$ .
3. If  $A, B, C$  are angles of a triangle such that  $x = \text{cis } A$ ,  $y = \text{cis } B$ ,  $z = \text{cis } C$ , then find the value of  $xyz$ .
4. If  $x^2 - 6x + 5 = 0$  and  $x^2 - 12x + p = 0$  have a common root, then find  $p$ .
5. If  $\alpha, \beta, \gamma$  are the roots of  $4x^3 - 6x^2 + 7x + 3 = 0$ , then find the value of  $\alpha\beta + \beta\gamma + \gamma\alpha$ .
6. If  ${}^n P_7 = 42 \cdot {}^n P_5$ , find  $n$ .
7. Find the number of ways of forming a committee of 5 members from 6 men and 3 ladies.
8. If  $A$  and  $B$  are coefficients of  $x^n$  in the expansion of  $(1 + x)^{2n}$  and  $(1 + x)^{2n-1}$  respectively, then find the value of  $\frac{A}{B}$ .
9. Find the mean deviation about the mean for the following data :  
3, 6, 10, 4, 9, 10.
10. A Poisson variable satisfies  $P(X = 1) = P(X = 2)$ . Find  $P(X = 5)$ .

## SECTION B

**II. Short Answer Type Questions :**

**5 × 4 = 20**

(i) Answer **ANY FIVE** questions.

(ii) Each question carries **FOUR** marks.

**11.** If  $(x - iy)^{1/3} = a - ib$ , then show that :

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

**12.** If  $x$  is real, prove that  $\frac{x}{x^2 - 5x + 9}$  lies between  $\frac{-1}{11}$  and 1.

**13.** Find the sum of all 4 digit numbers that can be formed using the digits 0, 2, 4, 7, 8 without repetition.

**14.** Prove that :

$${}^{25}C_4 + \sum_{r=0}^4 ({}^{29-r}C_3) = {}^{30}C_4.$$

**15.** Resolve :

$$\frac{x+3}{(1-x)^2(1+x^2)}$$

into partial fractions.

**16.** A and B are events with  $P(A) = 0.5$ ,  $P(B) = 0.4$  and  $P(A \cap B) = 0.3$ .

Find the probability that :

(i) A does not occur

(ii) Neither A nor B occurs.

**17.** A problem in calculus is given to two students A and B whose chances of solving it are  $\frac{1}{3}$  and  $\frac{1}{4}$  respectively. Find the probability of the problem being solved if both of them try independently.

## SECTION C

**III. Long Answer Type Questions :**

**5 × 7 = 35**

(i) Answer **ANY FIVE** questions.

(ii) Each question carries **SEVEN** marks.

**18.** If  $\alpha, \beta$  are the roots of the equation  $x^2 - 2x + 4 = 0$ , then for any  $n \in \mathbb{N}$ , show that :

$$\alpha^n + \beta^n = 2^{n+1} \cos\left(\frac{n\pi}{3}\right).$$

**19.** Solve the equation :

$$6x^6 - 25x^5 + 31x^4 - 31x^2 + 25x - 6 = 0.$$

**20.** If the coefficients of  $x^9, x^{10}, x^{11}$  in the expansion of  $(1 + x)^n$  are in A.P., then prove that  $n^2 - 41n + 398 = 0$ .

**21.** Find the sum of the series :

$$\frac{3 \cdot 5}{5 \cdot 10} + \frac{3 \cdot 5 \cdot 7}{5 \cdot 10 \cdot 15} + \frac{3 \cdot 5 \cdot 7 \cdot 9}{5 \cdot 10 \cdot 15 \cdot 20} + \dots \infty.$$

**22.** Find the deviation from the median for the following data :

$x_i$	$f_i$
6	4
9	5
3	3
12	2
15	5
13	4
21	4
22	3

**23.** Define independent and dependent events. State and prove multiplication theorem of probability.

**24.** The range of a random variable  $X$  is  $\{0, 1, 2\}$ . Given that :

$$P(X = 0) = 3C^3, P(X = 1) = 4C - 10C^2, P(X = 2) = 5C - 1.$$

(i) Find the value of  $C$ .

(ii)  $P(X < 1)$ ,  $P(1 < X \leq 2)$  and  $P(0 < X \leq 3)$ .