

BOARD OF INTERMEDIATE EDUCATION, A.P.

Mathematics – IIA

Model Question Paper (w.e.f. 2013-14)

Note: This Question paper consists of three sections A, B and

Time: 3 Hrs

Max. Marks: 75

SECTION – A

I. Very Short Answer type Questions

(i) Answer all Questions

(ii) Each Question carries 2 marks

10 x 2 = 20

1. Find the square root of $-5 + 12i$.
2. If $z_1 = -1, z_2 = i$ then find $\text{Arg} \left(\frac{z_1}{z_2} \right)$.
3. Find the value of $(1+i)^{16}$.
4. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then find the value of $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$.
5. Find the algebraic equation whose roots are two times the roots of $x^5 - 2x^4 + 3x^3 - 2x^2 + 4x + 3 = 0$.
6. Find the number of ways of arranging the letters of the word "INTERMEDIATE".
7. If ${}^n P_r = 5040$ and ${}^n C_r = 210$ find n and r .
8. If $(1 + x + x^2)^n = a_0 + a_1x + a_2x^2 + \dots + a_{2n}x^{2n}$ then find the value of $a_0 + a_2 + a_4 + \dots + a_{2n}$.
9. The variance of 20 observations is 5. If each observation is multiplied by 2, then find the new variance of the resulting observations.
10. A poisson variable satisfies $P(x = 1) = P(x = 2)$ Find $P(x = 5)$.

SECTION – B

II. Short Answer type Questions

(i) Answer any five Questions

(ii) Each Question carries 4 marks

5 x 4 = 20

11. If $z = x + iy$ and if the point P in the Argand plane represents z , find the locus of z satisfying the equation $|z - 2 - 3i| = 5$.
12. Find the range of $\frac{x+2}{2x^2+3x+6}$.

13. If the letters of the word MASTER are permuted in all possible ways and the words thus formed are arranged in the dictionary order, then find the rank of the word "REMAST".
14. Find the number of ways of selecting a cricket team of 11 players from 7 batsmen and 6 bowlers such that there will be at least 5 bowlers in the team.
15. Resolve $\frac{x^2 - 3}{(x + 2)(x^2 + 1)}$ into partial fractions.
16. Two persons A and B are rolling a die on the condition that the person who gets 3 will win the game. If A starts the game, then find the probabilities of A and B respectively to win the game.
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

(i) Answer any five Questions

(ii) Each Question carries 7 marks

5 x 7 = 35

18. Find all the roots of the equation $x^{11} - x^7 + x^4 - 1 = 0$.
19. Solve: $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$.
20. If n is a positive integer and x is any nonzero real number, then prove that

$$C_0 + C_1 \frac{x}{2} + C_2 \cdot \frac{x^2}{3} + C_3 \cdot \frac{x^3}{4} + \dots + C_n \cdot \frac{x^n}{n+1} = \frac{(1+x)^{n+1} - 1}{(n+1)x}.$$

21. If $x = \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \frac{1.3.5.7}{3.6.9.12} + \dots$ then prove that $9x^2 + 24x = 11$.

22. Calculate the variance and standard deviation for 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. The probabilities of three events A, B, C are such that $P(A) = 0.3$, $P(B) = 0.4$, $P(C) = 0.8$, $P(A \cap B) = 0.08$, $P(A \cap C) = 0.28$, $P(A \cap B \cap C) = 0.09$, and $P(A \cup B \cup C) \geq 0.75$, show that $P(B \cap C)$ lies in the interval $[0.23, 0.48]$.
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 | $2k^2$ | $7k^2 + k$ |

Find (i) k (ii) the mean (iii) $P(0 < X < 5)$.
