

Section-A**I. Very Short Answer Questions. Answer all Questions.****Each Question carries 'Two' marks****10x2=20M**

1. Find the square root of $(-5+12i)$
2. Find the modulus-amplitude form of $(1+i\sqrt{3})$
3. Find the value of $\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^5 - \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^5$
4. If α and β are the roots of $ax^2 + bx + c = 0$, find the value of $\alpha^3 + \beta^3$ in terms of a,b,c.
5. The product of the roots of $4x^3 + 16x^2 - 9x - a = 0$ is 9, then find a.
6. Find the number of ways of arranging 8 persons around a circular table if two particular persons were to sit together.
7. Find the number of ways of selecting 3 vowels and 2 consonants from the letters of the word EQUATION.
8. Find the term independent of x in the expansion of $\left(\frac{\sqrt{x}}{3} - \frac{4}{x^2}\right)^{10}$.
9. 8 coins are tossed simultaneously. Find the probability of getting atleast 6 heads.
10. The variance of 20 observations is 5. If each observation is multiplied by 2, then find the new variance of the resulting observations.

Section-B**II. Short Answer Questions. Answer any 'Five' Questions.****Each Question carries 'Four' marks.****5 x4 =20 M**

11. If the amplitude of $\left(\frac{z-2}{z-6i}\right) = \frac{\pi}{2}$, find its locus.
12. Prove that $\frac{1}{3x+1} + \frac{1}{x+1} - \frac{1}{(3x+1)(x+1)}$ does not lie between 1 and 4 if x is real.
13. If the letters of the word MASTER are permuted in all possible ways and the words thus formed are arranged in dictionary order, then find the rank of the word MASTER.
14. Find the number of ways of selecting 11 member cricket team from 7 bats men, 6 bowlers and 2 wicket keepers so that the team contains 2 wicket keepers and atleast 4 bowlers.

15. Resolve $\frac{2x^2 + 3x + 4}{(x-1)(x^2 + 2)}$ into partial fractions.
16. A bag contains 12 two rupee coins, 7 one rupee coins and 4 half a rupee coins. If 3 coins are selected at random, find the probability that
- the sum of 3 coins is maximum
 - the sum of 3 coins is minimum
 - each coin is of different value
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 Questions. Answer any 'Five' Questions.

Each Question carries 'Seven' marks.

5 x7 =35 M

18. If $\cos \alpha + \cos \beta + \cos \gamma = 0 = \sin \alpha + \sin \beta + \sin \gamma$, then show that
- $\cos 3\alpha + \cos 3\beta + \cos 3\gamma = 3\cos(\alpha + \beta + \gamma)$
 - $\sin 3\alpha + \sin 3\beta + \sin 3\gamma = 3\sin(\alpha + \beta + \gamma)$
19. Solve $2x^5 + x^4 - 12x^3 - 12x^2 + x + 2 = 0$
20. If n is a positive integer and x is any non zero real number, then prove that
- $$C_0 + C_1 \cdot \frac{x}{2} + C_2 \cdot \frac{x^2}{3} + C_3 \cdot \frac{x^3}{4} + \dots + C_n \cdot \frac{x^n}{n+1} = \frac{(1+x)^{n+1} - 1}{(n+1)x}.$$
21. Find the sum of the infinite series $\frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$
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. State and prove Addition Theorem on Probability.
24. If the range of a random variable X is $\{0,1,2\}$. Given that
- $$P(X = 0) = 3c^3, P(X = 1) = 4c - 10c^2, P(X = 2) = 5c - 1$$
- then find (i) the value of c
(ii) $P(X < 1)$, $P(1 < X \leq 2)$ (iii) $P(0 < X \leq 3)$.