MM:100 **XI MATHS** **TIME: 3HRS.**

Note : Section A comprises of 6 questions of 1 mark each, section B comprises of 13 questions of 4 marks each and section C comprises of 7 questions of 6 marks each.

SECTION-'A'

Q1. Find the value of $\cos(540^\circ - \theta) - \sin(630^\circ - \theta)$.

Q2. Evaluate $(i^{13} + i^{22} + i^{35} + i^{42})^3$.

Q3. If $P(n,4) = 15 \times P(n,3)$, find n.

Q4. Find the middle term in the expansion $(1 - 2x + x^2)^n$.

Q5. If $N = 10, \sum x = 50, \sum x^2 = 4250$, find standard deviation.

Q6. If $f(x) = x^n$ and if $f\,'(1) = 10$, find the value of n.

SECTION-'B'

Q7. Evaluate $\lim\limits_{x \to 0} \dfrac{x \tan 2x - 2x \tan x}{(1 - \cos 2x)^2}$.

Q8. If $\tan 20^\circ = p$ then prove that $\dfrac{\tan 160^\circ - \tan 110^\circ}{1 + \tan 160^\circ \tan 110^\circ} = \dfrac{1 - p^2}{2p}$.

OR

If the roots of the quadratic equation $x^2 + px + q = 0$ are $\tan 30^\circ$ and $\tan 15^\circ$, then find the value of $2 + q - p$.

Q9. The lines $2x - 3y = 5$ and $3x - 4y = 7$ are the diameters of a circle of area 154 sq. units. Find the equation of the circle.

Q10. If the coefficients of x^7 and x^8 in $\left(2 + \dfrac{x}{3}\right)^n$ are equal, find the value of n.

OR

Find the term independent of x in the expansion $\left(x^3 - \dfrac{1}{x^2}\right)^{15}$.

Q11. (i) Prove that $z_1 \overline{z_2} + \overline{z_1} z_2$ is purely real.

(ii) Find the real part of $z = \dfrac{1}{1 - \cos\theta - i \sin\theta}$.

Q12. Using principle of mathematical induction, prove that

$$\cos\alpha \cos 2\alpha \cos 4\alpha \ldots\ldots\ldots\ldots \cos(2^{n-1}\alpha) = \frac{\sin 2^n \alpha}{2^n \sin\alpha}.$$

Q13. Solve graphically: $x + 2y \le 10,\ x + y \ge 1, x - y \le 0, x \ge 0, y \ge 0$.

Q14. 65% students in a class like Cartoon movies, 70% like horror movies and 75% like war movies. What is the smallest percentage of students liking all the three type of movies?

Q15. If S be the sum, P be the product and R the sum of the reciprocals of n terms of a GP, prove that $\left(\dfrac{S}{R}\right)^n = P^2$.

Q16. Find the ratio in which the line segment joining the points $(2,-1,3)$ and $(-1,2,1)$ is divided by the plane $x+y+z=5$.

Q17. (i) If $y=f(x)=\dfrac{ax-b}{bx-a}$, show that $x=f(y)$.

(ii) Let f be defined by $f(x)=x-4$ and g be defined by $g(x)=\begin{cases}\dfrac{x^2-16}{x+4}, & x\neq -4\\ \lambda, & x=-4\end{cases}$.

Find the value of λ such that $f(x)=g(x)$ for all x.

Q18. Ten guests have to be seated, half on each side of a long table. Three particular guests desire to sit on one particular side and two others on the other side. Determine the number of ways which the seating arrangement can be made.

Q19. The total number of ways in which 5 balls of different colours can be distributed among 3 persons so that each person gets at least one ball.

SECTION-'C'

Q20. (i) Calculate the standard deviation of first n natural numbers.

(ii) Find the mean deviation about median for the following data

x_i	15	21	27	30	35
f_i	3	5	6	7	8

Q21. (i) Find the derivative of $\sqrt{\cos x}$ from first principle. [4]

(ii) Differentiate $\dfrac{x^n}{\sin x}$ w.r.t x. [2]

Q22. (i) An arc is in the form of a parabola with its axis vertical. The arc is 10 m high and 5 m wide at base. How wide is it 2 m from the vertex of the parabola?

(ii) If e_1, e_2 are the eccentricities of the hyperbola $2x^2-2y^2=1$ and the ellipse $x^2+2y^2=2$ respectively. Prove that $e_1e_2=1$.

Q23. (i) Show that the equation of a line passing through $(a\cos^3\theta, a\sin^3\theta)$ and perpendicular to the line $x\sec\theta+y\,\mathrm{cosec}\,\theta=a$ is $x\cos\theta-y\sin\theta=a\cos2\theta$.

(ii) If the line $y=mx$ meets the lines $x+2y-1=0$ and $2x-y+3=0$ at the same point, find the value of m.

Q24. Find the sum to n terms of the series 1.2.3+2.3.4+3.4.5+……

OR

Find the sum to n terms of the series 3+15+35+63+…..

Q25. (i) In a triangle ABC, if $\cos A=\dfrac{\sin B}{2\sin C}$, prove that the triangle is isosceles.

(ii) Prove that $\tan A+\tan(60^\circ+A)-\tan(60^\circ-A)=3\tan3A$.

Q26. (i) Four persons are to be chosen at random from a group of 3 men, 2 women and 4 children. Find the probability of selecting (a) exactly 2 men, (b) atleast one men.

(ii) One number is chosen from numbers 1 to 200. Find the probability that it is divisible by 4 or 6.

(Agt)

ANSWERS:

Q1. 0

Q2. 0

Q3. 18

Q4. $\frac{(2n)!}{(n!)^2}(-x)^n$

Q5. 20

Q6. 10

Q7. $\frac{1}{2}$

Q8. OR 3

Q9. $x^2+y^2-2x+2y=47$

Q10. $n=55 \quad OR \quad -{}^{15}C_9$

Q11. (ii) $\frac{1}{2}$

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Q14. 10%

Q16. 1:3 externally

Q17. (ii) $\lambda=-8$

Q18. 144000

Q19. 150

Q20. (i) $\sqrt{\frac{n^2-1}{12}}$ (ii) 5.1

Q21. (i) $-\frac{\sin x}{2\sqrt{\cos x}}$ (ii) $\frac{\sin x.(nx^{n-1})-x^n\cos x}{\sin^2 x}$

Q22. (i) $\sqrt{5}\,m$

Q23. (ii) -1

Q24. $\frac{n(n+1)(n+2)(n+3)}{4}$ OR $\frac{n}{3}(4n^2+6n-1)$

Q26. (i) (a) $\frac{5}{14}$, (b) $\frac{37}{42}$

(ii) $\frac{67}{200}$