Ankit Gupta Classes

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Class – XI

Subject – Mathematics

Time: 3hrs. **MM: 100**

GENERAL INSTRUCTIONS:

1) All questions are compulsory.
2) The question paper consists of 29 questions divided into three sections A, B, and C.
   - Section A comprises of 10 questions of 1 mark each.
   - Section B comprises of 12 questions of 4 marks each.
   - Section C comprises of 7 questions of 6 marks each.
3) All questions in Section A are to be answered as per the exact requirement of the questions.
4) There is no overall choice. However, internal choice has been provided in 4 questions of 4 marks each and 2 questions of 6 marks each.
5) Use of calculator is not permitted. But you may ask for mathematical table.

Section A

Q1. If A = {1, 2}, B = {1, 2, 3}. Write AxB. How many subsets AxB will have?

Q2. Solve; $x^2 + 3 = 0$

Q3. If ${}^nC_9 = {}^nC_8$. Find ${}^nC_{17}$.

Q4. Write the co-ordinate of foci, axis, the equation of directrix and the length of latus rectum of parabola

Q5. Find the centroid of the triangle whose three vertices are (3, –5, 7), (–1, 7, –6) and (1, 1, 2).

Q6. Evaluate: $\lim_{x\to 0} \dfrac{\sqrt{x+1}+\sqrt{x-1}}{x+1}$

Q7. Compute the derivative of $f(x) = e^{3\log x}$

Q8. The focal distance of the point on parabola is $y^2 = 4ax$ is 4. Find the abscissa of the point.

Q9. In how many ways three different rings can be worn in four fingers with at most one in each finger?

Q10. Find the value of $[(\sqrt{2}+1)^5 + (\sqrt{2}-1)^5]$

The More Goals You Set - The More Goals You Get.

Section B

Q11. If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = 9(n-1) : n \in N\}$ prove that $X \subset Y$

Q12. In a survey of 700 students in a college, 180 were listed as drinking Limca, 275 as drinking Mirinda and 95 were listed as both drinking Limca as well as Mirinda. Find how many students were drinking neither Limca nor Mirinda.

Q13. Find the value of $\cot 7\frac{1}{2}^\circ$

Or

If $\tan(\pi \cos\theta) = \cot(\pi \sin\theta)$, *prove that* $\cos\left(\theta - \frac{\pi}{4}\right)$

Q14. Prove that $\cos A \cos 2A \cos 2^2 A \cos 2^3 A \ldots\ldots\ldots\ldots\ldots\ldots \cos\cos 2^{n-1} A = \frac{\sin 2^n A}{2^n \sin A}$

Q15. Prove: $n^3 + (n+1)^3 + (n-2)^3$ is a multiple of 9.

Q16. Convert the complex $z = \dfrac{i-1}{\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}}$ number in the polar form

Q17. Find equation of the line which is equidistant from parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$

Q18. If S be the sum, P be the product and R be the sum of the reciprocals of n terms of a GP, show that $\left(\frac{S}{N}\right)^n = P^2$

OR

The sums of n terms of two arithmetic progressions are in the ratio 5n + 4 : 9n + 6. Find the ratio of their 18th terms.

Q19. Find the co-ordinates of the foot of the perpendicular from the point (–1, 3) to the line $3x - 4y - 16 = 0$.

Q20. Find the equation of the parabola whose focus is $(1, 1)$ and tangent at the vertex is $x + y = 1$.

Or

If e and e' be the eccentricities of the hyperbola and its conjugate, prove that $\frac{1}{e^2} + \frac{1}{e'^2} = 1$

Q21. Find the length of the perpendicular drawn from the point (b, a) to the line $\frac{x}{2x_1} + \frac{y}{2y_2} = 1$

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Q22. Find the derivative of $f(x) = Sinx + Cosx$ from the first principles.

"OR"

Find the derivative of $\frac{x^n - a^n}{x - a}$ for some constant **a**.

Section C

Q23. If A = {2, 4, 6, 8} B = {2, 3, 5, 7}, ∪ = {1, 2, 3, 4, 5, 6, 7, 8, 9}, verify:

i) $(A \cup B)^1 = A^1 \cap B^1$
ii) $(A \cap B)^1 = A^1 \cup B^1$
iii) A x B = B x A.

Q24. i) Prove that : $\cos A \cos(60 - A) \cos(60 + A) = \frac{1}{4} \cos 3A$

ii) $(Cosx - Cosy)^2 + (Sinx - Siny)^2 = 4Sin^2 \frac{x - y}{2}$.

Q25. If α and β different complex numbers with $|\beta| = 1$ then find $\left|\frac{\beta - \alpha}{1 - \overline{\alpha}\beta}\right|$

Q26. Find '**a**' if 17th and 18th terms in the expansion of $(2 + a)^{50}$ are equal.

"OR"

i) Find the term independent of x in the expansion of $\left(\frac{3}{2} x^2 - \frac{1}{3x}\right)^6$.

ii) The coefficient of $x^6 y^3$ in the expansion of $(x + 2y)^9$.

Q27. Find the variance and standard deviation:

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency	3	7	12	15	8	3	2

Q28. A and B are two events such that P(A) = 0.42, P(B) = 0.48 and P(A and B) = 0.16. Determine:

i) P(not A)
ii) P(notB)
iii) P(A or B)

"OR"

A box contain 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, what is the probability that:

i) all will be blue
ii) at least one will be green?

Q29. In a survey of 25 students, it was formed that 15 had taken mathematics, 12 had taken physics and 11 had taken chemistry, 5 had taken Maths and Chemistry, 9 had and 3 had taken all three subjects. Find the number of students that had taken.

a) Only Maths
b) Physics and Chemistry but not Maths
c) Only one of the subjects
d) Atleast one of three subjects
e) None of three subjects