Model Paper Mathematics Class 11

Note: Attempt all questions of Section-A by filling the corresponding bubble on the MCQs RESPONSE SHEET. It is mandatory to return the attempted MCQs sheet to the Superintendent within given time.

Paper: Mathematics **Marks: 20**

Class: 1st year **Roll No_______________**

SECTION-A

1. $\frac{(n+2)!}{(n+1)!}=$……………………………………..

   A) $(n+1)!$ B) $(n+2)!$ C) $(n+2)$ D) $(n+1)$

2. A square matrix $A=[a_{ij}]_{m\times n}$ is called upper triangular if:

   A) $a_{ij}=0,\forall\, i>j$ B) $a_{ij}=0,\forall\, i<j$ C) $a_{ij}=0,\forall\, i=j$ D) $a_{ij}=1,\forall\, i=j$

3. The concept of complex numbers as a+bi form was given by………………..

   A) Gauss B) Newton C) Archimedes D) Euler

4. If a square matrix A has two identical rows or columns then det $(A)=$…………

   A) Zero B) not equal to zero C) negative D) none of these

5. The period of $\sin\frac{2}{3}x$ is ……………………

   A) π B) 2π C) 3π D) 4π

6. If $\vec{a}, \vec{b}, \vec{c}$ are three non-zero vectors, then the expression $\vec{a}.(\vec{b}.\vec{c})$ is ……………………

   A) Scalar triple product B) Volume of parallelepiped C) Meaningless D) Dot product

7. The axis of symmetry of the parabola $y=3x^2-6x+1$ is ………………………..

   A) $x=-1$ B) $x=1$ C) $x=-2$ D) $x=2$

8. The maximum value of the function $f(x,y)=2x+4y$ subjected to the constraints $x\geq 3$ and $y\geq 3$ is ………..

   A) 24 B) 20 C) 18 D) 4

9. If terminal ray of θ is in the fourth quadrant, then $\frac{\theta}{2}$ lies in ……………………. quadrant.

   A) First B) Second C) Third D) Fourth

10. If $y=\sin 6\theta$ then frequency is …………………..

    A) 2π B) $\frac{\pi}{3}$ C) $\frac{3}{\pi}$ D) $\frac{2\pi}{3}$

11. If A is a non zero matrix then number of non zero row in its echelon form is called…………… of the matrix.

    A) Solution B) Rank C) Value D) none of these

12. The number of terms in the expansion of $(a+b)^{100}$ is …………………

    A) 99 B) 100 C) 101 D) 102

13. The sum of the odd coefficient in the binomial expansion of $(1+x)^n$ is equal to…………

    A) 2^n B) 2^{n+1} C) 2^{n-2} D) 2^{n-1}

14. Two vectors $\vec{a}$ and $\vec{b}$ are parallel, for scalar λ if and only if ………..

    A) $a\neq b$ B) $a=\lambda+b$ C) $a=\lambda b$ D) none of these

15. If $f(x)=\frac{1}{x}$ then domain of $f(x)$ is …………………

    A) $\mathcal{R}$ B) $R-0$ C) $\mathcal{R}-\{0\}$ D) ∞

16. If $Sin\theta=\frac{4}{5}$, then $Sin\,3\theta=$……………………

    A) $\frac{11}{125}$ B) $\frac{33}{125}$ C) $\frac{44}{125}$ D) $\frac{22}{125}$

17. A coin is flipped thrice. The number of sample space points are ……………

    A) 3 B) 8 C) 9 D) 12

18. $1^2+2^2+3^2+\cdots+n^2=$……………………………………

    A) $\frac{n}{2}$ B) $\frac{n(n+1)}{2}$ C) $\frac{n(n+1)(2n+1)}{6}$ D) $\left(\frac{n(n+1)}{2}\right)^2$

19. If none of the angle of a triangle is right angle is called ………………… triangle.

    A) Obtuse B) Oblique C) Acute D) None

20. Infinite geometric series is convergent if and only if ………………………………..

    A) $|r|<1$ B) $|r|\geq 1$ C) $|r|>1$ D) $|r|\geq 1$

Paper: Mathematics

Class: 1st year **Time: 2hr 40 min**

SECTION-B **Marks 50**

Q.1 Attempt **Any ten** of the following short questions. Each question carries 5 marks.

i. Find the solutions to the equation $z^3 = -1$.

ii. What is the cosine of the angle which the vector $\hat{\imath} + \sqrt{2}\hat{\jmath} + \hat{k}$ makes with $z - axis$.

iii. Show that: $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$

iv. Prove that $\frac{1+\tan^2\frac{\propto}{2}}{1-\tan^2\frac{\propto}{2}} = \sec\propto$

v. If a pair of dice is thrown, find the probability that the sum of digits is neither 10 nor 11

vi. If x is nearly equal to unity, then show that $px^p - qx^q = (p-q)x^{p+q}$

vii. Prove that the sum of n arithmetic means between a and b is equal to n times their arithmetic mean.

viii. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 0 & 3 \\ 3 & 2 & -1 & 0 \\ 2 & -1 & 0 & 1 \end{bmatrix}$.

ix. If $f(x) = \frac{x+5}{x-6}$ find domain and range of f^{-1}.

x. Find λ, if the vectors $\vec{a} = \lambda\hat{\jmath} + 3\hat{k}$, $\vec{b} = 2\hat{\imath} - \hat{\jmath} - \hat{k}$ and $\vec{c} = \hat{\imath} + 3\hat{\jmath} + \hat{k}$ are coplanar?

xi. Use the law of cosine to prove $1 + \cos\beta = \frac{(a+c+b)(a+c-b)}{2ac}$.

xii. Sum to n term the series $1 + 4x + 7x^2 + 10x^3 + \cdots$

xiii. Prove that $\text{Sin}^{-1}x + \text{Cos}^{-1}x = \frac{\pi}{2}$

SECTION-C **Marks 30**

Note: Attempt **Any Three** of the long questions. Each question carries 10 marks.

Q2. (i) Prove that for any equilateral triangle $r{:}R{:}r_1 = 1{:}2{:}3$

(ii) Use Cramer's rule to solve $x - y + 4z = 4,\ 2x + 2y - z = 2,\ 3x - 2y + 3z = -3$.

Q3. (i) If $y = \frac{x}{3} + \frac{x^2}{3^2} + \frac{x^3}{3^3} + \cdots$ where $0 < x < 3$, then show that $x = \frac{3y}{1+y}$

(ii) Maximize $f(x,y) = 2x + y$ subject to the constraints $x + y \le 6, x + y \ge 1, x, y \ge 0$.

Q4. (i) Find the area of a parallelogram whose diagonals are: $\vec{a} = 4\hat{\imath} + \hat{\jmath} - \hat{k}$ and $\vec{b} = 2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$

(ii) If $z_1 = 1 + i,\ z_2 = 1 - i$ the find $\left|\frac{z_1+z_2+1}{z_1-z_2+1}\right|$

Q5 (i) How many numbers each lying between 10 and 1000 can be formed with digits 2,3,4,0,8,9 using only once?

(ii) Find maximum and minimum of the function $y = \frac{1}{18-5\sin(3\theta-45)}$.