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MATHEMATICS HSSC-I

SECTION – A (Marks 20)

Time allowed: 25 Minutes

Version Number	1	8	7	1
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Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) What is the value of i^{13} ?

- A. $-i$ B. i C. 1 D. -1

2) How many inverse elements correspond to each element of group?

- A. At least two B. Only one C. At least one D. Two

3) If A is any Matrix of order $m \times n$ then minor of matrix of any one element has order:

- A. $m \times n$ B. $(m-1) \times n$ C. $m \times (n-1)$ D. $(m-1) \times (n-1)$

4) What is the value of $(-1 + \sqrt{3}.i)^4 + (-1 - \sqrt{3}.i)^4$?

- A. 16 B. -16 C. 4 D. -4

5) The partial fraction of $\frac{1}{1+x^3}$ will be in the form of:

- A. $\frac{A}{1-x} + \frac{Bx+C}{1+x+x^2}$ B. $\frac{A}{(1+x)} + \frac{Bx+C}{(1+x^2)}$

- C. $\frac{A}{x+1} + \frac{C+Bx}{x^2-x+1}$ D. $\frac{A}{x+1} + \frac{Bx+C}{x^2+x+1}$

6) What is the value of S_{19} if terms of of $A.P$ are $2 + \frac{7}{2} + 5 + \frac{13}{2} + \dots + 19th$

- A. $\frac{129}{2}$ B. $\frac{529}{2}$ C. $\frac{829}{2}$ D. $\frac{589}{2}$

7) What is the value of n , if ${}^n C_8 = {}^n C_{12}$?

- A. 8 B. 12 C. 4 D. 20

8) What is the term independent of a in the expansion of $\left(\frac{a}{2} - \frac{2}{a}\right)^6$?

- A. $\frac{15}{4}$ B. -20 C. $\frac{-15}{4}$ D. 20

9) What is the Arc length if an arc subtends an angle $60^\circ 20'$ with radius $18mm$?

- A. 20.6 B. 20.5 C. 25.5 D. 26.5

10) What is the value of $\sin 9\theta$?

- A. $4 \cos^3 \theta - 3 \cos^3 \theta$ B. $3 \cos^3 3\theta - 4 \cos 3\theta$
C. $3 \sin 3\theta - 4 \sin^3 3\theta$ D. $4 \sin 3\theta - 3 \sin^3 \theta$

- 11) What is the value of $\cos\left(\frac{3\pi}{2} + \theta\right)$?
- A. $\cos \theta$ B. $\sin \theta$ C. $-\sin \theta$ D. $-\cos \theta$
- 12) In a triangle if $a=17, b=10, c=21$, then what is the value of R ?
- A. $\frac{85}{8}$ B. $\frac{83}{8}$ C. $\frac{81}{8}$ D. $\frac{87}{8}$
- 13) What is the value of $\frac{\pi}{2} - \sin^{-1} x$?
- A. $\sin^{-1} x$ B. $-\sin^{-1} x$ C. $\cos^{-1} x$ D. $-\cos^{-1} x$
- 14) What is the representation of conjunction of two statements p & q ?
- A. $p \wedge q$ B. $p \vee q$ C. $p \rightarrow q$ D. $p \leftrightarrow q$
- 15) If a sequence has condition $a_n - a_{n-1} = n+1$, $a_4 = 14$ then a_5 has value:
- A. 16 B. 20 C. 26 D. 24
- 16) $\frac{\sqrt{(S-b)(S-c)}}{\sqrt{S(S-a)}} = ?$
- A. $\sin \frac{\alpha}{2}$ B. $\tan \frac{\beta}{2}$ C. $\tan \frac{\gamma}{2}$ D. $\tan \frac{\alpha}{2}$
- 17) What is the range of $\cot^{-1}(x)$?
- A. $-1 < x < 1$ B. $0 \leq x \leq \pi$ C. $0 < x < \pi$ D. $-\frac{\pi}{2} < x < \frac{\pi}{2}$
- 18) What is the multiplicative inverse of $1 - 2i$?
- A. $\frac{1-2i}{4}$ B. $\frac{1+2i}{5}$ C. $\frac{1+2i}{\sqrt{5}}$ D. $\frac{1-2i}{\sqrt{5}}$
- 19) The solution set of $\cos x - \sin x = 0$ in $[0, \pi]$ is:
- A. $\frac{5\pi}{4}$ B. $\frac{\pi}{3}$ C. $\frac{\pi}{4}$ D. $\frac{5\pi}{3}$
- 20) What is the rank of $\begin{bmatrix} 1 & 2 & 5 \\ 0 & 0 & 0 \\ 3 & 2 & 0 \end{bmatrix}$
- A. 3 B. 2 C. 1 D. 0



MATHEMATICS HSSC-I

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Time allowed: 2:35 Hours

Total Marks Sections B and C: 80

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly. Graph paper will be provided on request.

SECTION - B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks. (10 x 4 = 40)

- (i) If $Z_1 = 2 + i$, $Z_2 = 3 + 2i$, $Z_3 = 1 + 3i$ then find the value of $\frac{\bar{Z}_1 \cdot \bar{Z}_2}{Z_3}$ in form of $a + bi$
- (ii) By using truth table prove that $p \vee (\sim p \wedge \sim q) \vee (p \wedge q) = p \vee (\sim p \wedge \sim q)$
- (iii) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$
- (iv) Solve the Equation $4 \cdot 2^{2x-1} - 9 \cdot 2^x + 1 = 0$
- (v) Resolve into partial fraction $\frac{2x+1}{(x+3)(x-1)(x+2)^2}$
- (vi) Find the sum to n^{th} term of series $r + (1+k)r^2 + (1+k+k^2)r^3 + \dots n$
- (vii) Find the number greater than 23000 that can be formed from digit 1, 2, 3, 5, 6 without repeating any digit.
- (viii) If x is so small that its square and higher powers may be neglected then show that $\frac{(1+x)^{\frac{1}{2}}(4-3x)^{\frac{3}{2}}}{(8+5x)^{\frac{1}{3}}} \approx 4\left(1 - \frac{5x}{6}\right)$
- (ix) Find correct to nearest centimeter distance at which a coin of diameter 1 cm should be held so as to conceal the full moon whose diameter subtends an angle of $31'$ at the eye of observer on the earth.
- (x) Prove that $\sqrt{\frac{1+\sin \alpha}{1-\sin \alpha}} = \frac{\sin \frac{\alpha}{2} + \cos \frac{\alpha}{2}}{\sin \frac{\alpha}{2} - \cos \frac{\alpha}{2}}$
- (xi) Draw the graph of $y = \cos x$ from 0 to 2π
- (xii) By using usual notation prove that $r_1 = \frac{\Delta}{s-a}$
- (xiii) Show that $\cos^{-1}(-x) = \pi - \cos^{-1} x$
- (xiv) Find the solution set of $\sin 3x + \sin 2x + \sin x = 0$

SECTION - C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks. (5 x 8 = 40)

- Q. 3** Use Matrices to solve the system of equations $2x_1 + x_2 + 3x_3 = 3$
 $x_1 + x_2 - 2x_3 = 0$
 $-3x_1 - x_2 + 2x_3 = -4$
- Q. 4** Solve the system of equation $x^2 - y^2 = 5$
 $4x^2 - 3xy = 18$
- Q. 5** If the numbers $\frac{1}{2}, \frac{4}{21}$ and $\frac{1}{36}$ are subtracted from three consecutive term of G.P the resulting numbers are in H.P. Find the numbers if their product is $\frac{1}{27}$.
- Q. 6** Identify the following Series and find its sum. $1 - \frac{1}{2}\left(\frac{1}{2}\right) + \frac{1 \cdot 3}{2 \cdot 4}\left(\frac{1}{2}\right)^2 - \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6}\left(\frac{1}{2}\right)^3 + \dots$
- Q. 7** Find the value of $\sin(\alpha + \beta)$ and $\cos(\alpha + \beta)$ if $\tan \alpha = \frac{-15}{8}$ and $\sin \beta = \frac{-7}{25}$, neither α nor β lie in 4th quadrant.
- Q. 8** Prove that $\cos^{-1} \frac{63}{65} + 2 \tan^{-1} \frac{1}{5} = \sin^{-1} \frac{3}{5}$
- Q. 9** Show that the set consisting of elements of form $\{a + \sqrt{3}b \mid (a, b \text{ being rational})\}$ is an abelian group w.r.t addition.



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MATHEMATICS HSSC-I

SECTION – A (Marks 20)

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Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) In a matrix $A = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$ what is value of A_{22} ?

A. 9 B. -9 C. 6 D. -6

2) If $r = n$ or $r = 0$ what is the value of ${}^n C_r$?

A. 0 B. r C. 1 D. n

3) What is the value of $\frac{2}{1-i}$?

A. $2(1+i)$ B. $2(1-i)$ C. $1+i$ D. $1-i$

4) If set A has 5 elements, then how many binary relations are in $A \times A$?

A. 2^{25} B. $2^{25} - 1$ C. 25 D. 2^5

5) If A is a matrix of order $m \times n$ and B is a matrix of order $n \times l$, then what is order of matrix $A \times B$?

A. $m \times n$ B. $l \times m$ C. $l \times n$ D. $m \times l$

6) What is the product of root of quadratic equation $x^2 - 3x + 6 = 0$?

A. 6 B. -6 C. 3 D. -3

7) What is the partial fraction of $\frac{7x+25}{(x+3)(x+4)}$?

A. $\frac{4}{x+3} - \frac{3}{x+4}$ B. $\frac{4}{x+4} - \frac{3}{x+3}$ C. $\frac{4}{x+3} + \frac{3}{x+4}$ D. $\frac{4}{x+4} + \frac{3}{x+3}$

8) What is the sum of infinite G.P $2, \sqrt{2}, 1, \dots$?

A. $4 - \sqrt{2}$ B. $4 + 2\sqrt{2}$ C. $2\sqrt{2}$ D. $2 + 2\sqrt{2}$

9) What is the value of $r! {}^n C_r$?

A. ${}^{n+1} P_r$ B. ${}^{n-1} C_r$ C. ${}^n P_r$ D. ${}^{n+1} C_r$

10) For what value of n the expression $3^n > n!$ is **UNTRUE** if $n \in Z$

A. $n = 6$ B. $n = 7$ C. $n = 2$ D. $n = 3$

11) Which of the following angles are coterminal?

A. $\frac{\pi}{3}, \frac{4\pi}{3}$ B. $\frac{\pi}{3}, \frac{5\pi}{6}$ C. $\frac{\pi}{3}, \frac{13\pi}{3}$ D. $\frac{5\pi}{3}, \frac{\pi}{3}$

- 12) What is the value of $\tan 3\theta$?
- A. $\frac{3 \tan \theta + \tan^3 \theta}{1 + 3 \tan^2 \theta}$ B. $\frac{3 \tan \theta - \tan^3 \theta}{1 - 3 \tan^2 \theta}$ C. $\frac{3 \tan \theta + \tan^3 \theta}{1 - 3 \tan \theta}$ D. $\frac{3 \tan \theta - \tan^3 \theta}{1 + 3 \tan \theta}$
- 13) What is the period of $3 \cos \frac{x}{5}$?
- A. 13π B. 10π C. $\frac{15\pi}{3}$ D. $\frac{13\pi}{5}$
- 14) What is the range of Function $y = \cot x$?
- A. $-1 \leq y \leq 1$ B. $-1 \leq x \leq 1$ C. $-\infty < x < \infty$ D. $-\infty < y < \infty$
- 15) What is the value of r_2 ?
- A. $S \tan \frac{r}{2}$ B. $S \tan \beta$ C. $S \tan \frac{\alpha}{2}$ D. $S \tan \frac{\beta}{2}$
- 16) What is solution of $1 + \cos x = 0$ for complete period?
- A. $\{-\pi + n\pi\}$ B. $\{\pi + n\pi\}$ C. $\{-\pi + 2n\pi\}$ D. $\{\pi + 2n\pi\}$
- 17) What is the area of triangle in Square Units if $b = 21.6$ $c = 30.2$ $\alpha = 52^\circ 40'$?
- A. 295.3 B. 952.3 C. 259.3 D. 529.3
- 18) A die is rolled, what is the probability that dots on top are greater than 4 ?
- A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{1}{4}$
- 19) What is the multiplicative inverse of $1 + 2i$?
- A. $\frac{1}{\sqrt{5}}(1 - 2i)$ B. $\frac{1}{5}(1 - 2i)$ C. $\frac{1}{5}(1 + 2i)$ D. $\frac{1}{4}(1 - 2i)$
- 20) What is value of $\tan^{-1} x$?
- A. $\frac{\pi}{2} + \cot^{-1} x$ B. $\frac{\pi}{2} + \tan^{-1} x$ C. $\frac{\pi}{2} - \cot^{-1} x$ D. $\frac{\pi}{2} - \tan^{-1} x$



MATHEMATICS HSSC-I

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Total Marks Sections B and C: 80

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly. Graph paper will be provided on request.

SECTION - B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks.

(10 x 4 = 40)

- (i) Separate into real and imaginary part $\frac{(-2+3i)^2}{1+i}$
- (ii) If $S = \{1, -1, i, -i\}$ show that S is abelian group under multiplication.
- (iii) Show $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$
- (iv) Solve the system of equation $3x + 4y = 25, \frac{3}{x} + \frac{4}{y} = 2$
- (v) Resolve into Partial fraction $\frac{4x}{(x+1)^2(x-1)}$
- (vi) Obtain the sum of all Integers in the first 1000 integers which are neither divisible by 5 nor by 2
- (vii) Prove that ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$
- (viii) Find the term Independent of x in the expression of $(1+x^2)^3 \left(1 + \frac{1}{x^2}\right)^4$
- (ix) If $\cot \theta = \frac{5}{2}$ and terminal arm of angle is in 1st quadrant then find the value of $\frac{3\sin \theta + 4\cos \theta}{\cos \theta - \sin \theta}$
- (x) If α, β, γ are the angles of triangle ABC, then show that $\cot \frac{\alpha}{2} + \cot \frac{\beta}{2} + \cot \frac{\gamma}{2} = \cot \frac{\alpha}{2} \cot \frac{\beta}{2} \cot \frac{\gamma}{2}$
- (xi) Prove that $\frac{\operatorname{cosec} \theta + 2 \operatorname{cosec} 2\theta}{\sec \theta} = \cot \frac{\theta}{2}$
- (xii) Prove that $r = \frac{\Delta}{S}$ (with usual notation)
- (xiii) Prove that $2 \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{7} = \frac{\pi}{4}$
- (xiv) Find the solution set of $3\cos^2 \theta - 2\sqrt{3} \sin \theta \cos \theta - 3\sin^2 \theta = 0$

SECTION - C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks.

(5 x 8 = 40)

Q. 3 Solve the following system of equation by reducing the augmented matrix into reduced echelon forms.

$$x + 2y + z = 2$$

$$2x + y + 2z = -1$$

$$2x + 3y - z = 9$$

Q. 4 Solve the equation: $\sqrt{x^2 + 4x - 21} + \sqrt{x^2 - x - 6} = \sqrt{6x^2 - 5x - 39}$

Q. 5 If three consecutive number in an $A.P.$ are increased by 1,4,15 respectively the resulting number are in G.P. Find the original number if their sum is 6.

Q. 6 If $y = \frac{1}{3} + \frac{1.3}{2!} \left(\frac{1}{3}\right)^2 + \frac{1.3.5}{3!} \left(\frac{1}{3}\right)^3 + \dots$ then prove that $y^2 + 2y - 2 = 0$

Q. 7 Prove that $\sin \frac{\pi}{9} \sin \frac{2\pi}{9} \sin \frac{\pi}{3} \sin \frac{4\pi}{9} = \frac{3}{16}$

Q. 8 Prove that $r_1 + r_2 + r_3 - r = 4R$

Q. 9 Find the solution set of $\cos 2x = \sin 3x$