MATHEMATICS HSSC–I

SECTION – A (Marks 20)

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Time allowed: 25 Minutes | **Version Number** | 3 | 1 | 1 | 1 |

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) Every real number is a/an _____ number.

A. Natural B. Rational **C.** Irrational D. Complex

2) If a, b are elements of group G, then $(ab)^{-1} =$

A. $a^{-1}b^{-1}$ B. $b^{-1}a^{-1}$ **C.** ba^{-1} D. ab^{-1}

3) Under which operation the set of all 2×2 matrices form a non abelian group?

A. Addition B. Subtraction **C.** Multiplication D. Division

4) If $\begin{vmatrix} s & t \\ 7 & 0 \end{vmatrix} = \begin{vmatrix} 2 & 3 \\ 1 & -9 \end{vmatrix}$, then what will be the value of t?

A. $\frac{1}{3}$ B. $\frac{-1}{3}$ **C.** 3 D. -3

5) What will be the product of roots of $ay^2-(a+1)y+2a+1=0$, when sum of roots is 2?

A. 1 B. 2 **C.** 3 D. 4

6) Which of the following is n^{th} term of Arithmatic progression $2,6,10,\ldots$?

A. $2(2n-1)$ B. $2(2n+1)$ **C.** $2(2n+3)$ D. $2(2n-3)$

7) Which of the following relation is true between Arithmatic, Geomatric and Harmonic means?

A. $G^2=A^2\times H^2$ B. $A^2=G\times H$ **C.** $H^2=G^2\times A^2$ D. $G^2=A\times H$

8) Which is the factorial form of $n(n-1)(n-2)\ldots(n-r+1)$?

A. $n!$ B. $(n-r+1)!$ **C.** $\frac{n!}{(n-r+1)!}$ D. $\frac{n!}{(n-r)!}$

9) A natural number is chosen out of the first fifty natural numbers, then what is the probability that the chosen number is a multiple of 3 or of 5 ?

A. $\frac{26}{50}$ B. $\frac{23}{50}$ **C.** $\frac{16}{50}$ D. $\frac{10}{50}$

10) What is the condition on x for the expansion of $(1+2x)^{\frac{1}{2}}$ by bionomial series?

A. $|x|<\frac{1}{2}$ B. $|x|>1$ **C.** $|x|<1$ D. $|x|>\frac{1}{2}$

11) If $\cot\theta = \frac{15}{8}$ and the terminal arm of the angle is not in quad-I, then which of the following is the value of $\operatorname{cosec}\theta$

A. $\frac{-8}{17}$ B. $\frac{8}{15}$ C. $\frac{17}{8}$ D. $\frac{-17}{8}$

12) Which of the following angles has same values of trigonometric function as of -675° ?

A. $\frac{\pi}{6}$ B. $\frac{\pi}{4}$ C. $\frac{\pi}{3}$ D. $\frac{\pi}{2}$

13) What will be the product form of $\cos 7\theta - \cos\theta$

A. $-2\sin 4\theta\cos 3\theta$ B. $2\sin 4\theta\sin 3\theta$ C. $2\sin 3\theta\cos 4\theta$ D. $-2\sin 4\theta\sin 3\theta$

14) In any triangle ABC, $\frac{b^2+c^2-a^2}{2bc} =$

A. $\cos\alpha$ B. $\sin\alpha$ C. $\cos\beta$ D. $\sin\beta$

15) Radius of circle which passes trhough the vertices of a triangle is called:

A. Circum radius B. In-radius C. E-radius D. C-radius

16) A man of 6 feet height casts a 2 feet shadow. What will be the angle of elevation of the sun?

A. $70°33'$ B. $71°34'$ C. $71°35'$ D. $71°31'$

17) The graph of $y = \cos x$ lies between the horizontal lines $y = 1$ and:

A. $y = -1$ B. $y = 0$ C. $y = 2$ D. $y = -\frac{1}{2}$

18) Period of $\cos 2x$ is:

A. 4π B. 2π C. π D. $\frac{\pi}{2}$

19) To which of the following intervals should the domain of the function $y = \sin x$ be restricted to obtain principal sine function?

A. $[-\pi, 0]$ B. $[0, \pi]$ C. $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ D. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

20) What will be the solution set of trigonometric equation $\tan x = 0$?

A. $\left\{\frac{3\pi}{2}\right\}$ B. $\left\{\frac{\pi}{2}\right\}$

C. $\left\{\frac{n\pi}{2}\right\}, n \in Z$ D. $\left\{\frac{n\pi}{2}\right\}$, *n is an even integer*

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) Prove that $\overline{\left(\frac{Z_1}{Z_2}\right)} = \frac{\overline{Z_1}}{\overline{Z_2}}$, $Z_1, Z_2 \in C$; $Z_2 \neq 0$

(ii) If $(G,*)$ is a group with e its identity, then e is unique. Prove it.

(iii) If $A = \begin{bmatrix} i & 1+i \\ 1 & -i \end{bmatrix}$, show that $A - (\overline{A})^t$ is skew hermitian.

(iv) Without expansion verify that $\begin{vmatrix} mn & l & l^2 \\ nl & m & m^2 \\ lm & n & n^2 \end{vmatrix} = \begin{vmatrix} 1 & l^2 & l^3 \\ 1 & m^2 & m^3 \\ 1 & n^2 & n^3 \end{vmatrix}$

(v) If ω is a root of $x^2 + x + 1 = 0$, show that its other root is ω^2 and also show that $\omega^3 = 1$

(vi) If α and β are roots of $x^2 - 3x + 5 = 0$ form the equation whose roots are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$

(vii) Resolve into partial fraction $\frac{x^2}{(x^2+4)(x+2)}$

(viii) If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in an A.P, show that $b = \frac{2ac}{a+c}$

(ix) Find the value of n , when ${}^nC_{10} = \frac{12 \times 11}{2!}$

(x) Use mathematical induction to show that $1 + 2 + 2^2 + \ldots + 2^n = 2^{n+1} - 1$ for all non-negative integers n.

(xi) Prove that $\frac{1-\sin\theta}{\cos\theta} = \frac{\cos\theta}{1+\sin\theta}$

(xii) Find the value without using tables/calculator $\sin 19^\circ \cos 11^\circ + \sin 71^\circ \sin 11^\circ$

(xiii) Show $\tan^{-1}\frac{120}{119} = 2\cos^{-1}\frac{12}{13}$

(xiv) Find the value of θ satisfying the equation $4\sin^2\theta - 8\cos\theta + 1 = 0$

SECTION – C (Marks 40)

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

Q. 3 Find real and imaginary parts of $(x+iy)^n$. Also calculate imaginary part of $(\sqrt{3}+i)^3$.

Q. 4 Solve the system of linear equations:

$$3x + 2y - 2z = 12$$
$$y - 2z + 2x = 9$$
$$2z + x + 4y = 2$$

Q. 5 Show that the roots of the given equation are real:

$$(x-a)(x-b) + (x-b)(x-c) + (x-c)(x-a) = 0$$

Q. 6 Find the sum of n terms of series whose n^{th} term is: $T_n = n^2 + 4n + 1$

Q. 7 If $2y = \frac{1}{2^2} + \frac{1 \cdot 3}{2!}\cdot\frac{1}{2^4} + \frac{1 \cdot 3 \cdot 5}{3!}\cdot\frac{1}{2^6} + \ldots$ then prove that $4y^2 + 4y - 1 = 0$

Q. 8 Prove the fundamental law of trigonometry.

Q. 9 Show with usual notation $r_1 + r_2 + r_3 - r = 4R$