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Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. **Do not use lead pencil.**

MATHEMATICS HSSC–I

SECTION – A (Marks 20)

Time allowed: 25 Minutes

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دیے گئے خانوں میں مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Fill the relevant bubble against each question:

ہر سوال کے سامنے دیے گئے درست دائرہ کو پُر کریں۔

1. For a complex number z, all the following formulas are true **EXCEPT**:
   ◯ $\overline{\overline{z}} = z$ ◯ $z\bar{z} = \lvert z \rvert^2$ ◯ $z^2 = \lvert z \rvert^2$ ◯ $\lvert z \rvert = \lvert \bar{z} \rvert$

2. Which of the following sets forms an abelian group under the operation of multiplication?
   ◯ Set of rational numbers ◯ Set of integers ◯ Set of natural numbers ◯ Set of non-zero real numbers

3. Suppose the number of players that play cricket and hockey are 15 and 13 respectively. If the total number of players is 21, what is the number of players that play both the games?
   ◯ 6 ◯ 8 ◯ 7 ◯ 28

4. If A is a matrix of order 3×4, then which of the following equalities is **TRUE**?
   ◯ $AI_3 = A$ ◯ $I_4A = A$ ◯ $AA' = I_4$ ◯ $AI_4 = A$

5. $\begin{vmatrix} 1 & 0 & 0 \\ 2 & -i & 0 \\ 3 & -2 & i \end{vmatrix} =$
   ◯ 1 ◯ −1 ◯ i ◯ $-i$

6. If $f(x)$ is a polynomial with only two roots 1 and 2, then $f(x) =$
   ◯ x^2+3x-2 ◯ x^2+3x+2 ◯ x^2-3x+2 ◯ x^2-3x-2

7. If one root of the equation $f(x)=0$ is -1, then $5-f(-1) =$
   ◯ 6 ◯ 4 ◯ 5 ◯ −6

8. The partial fraction of $\frac{1}{1-x^3}$ will be in the form of:
   ◯ $\frac{A}{1-x}+\frac{Bx+C}{1-x^2}$ ◯ $\frac{A}{1-x}+\frac{Bx+C}{1+x+x^2}$ ◯ $\frac{A}{1-x}+\frac{Bx+C}{(1-x)^2}$ ◯ $\frac{A}{1-x}+\frac{B}{1-x+x^2}$

9. If $a_1=-1$ in a sequence with general term $a_n = n + a_{n-1}$ then sum of first two terms S_2 is:
   ◯ 0 ◯ 1 ◯ −1 ◯ 2

10. If b is a harmonic mean between -2 and 4 then $b=...$ ◯ 8 ◯ -8 ◯ 1 ◯ -1

11. $\binom{8}{7}+\binom{8}{6}=$ ◯ 72 ◯ 48 ◯ 63 ◯ 36

12. If a fair die is rolled, then what is the probability that the top is an even number? ◯ $\frac{1}{2}$ ◯ $\frac{1}{3}$ ◯ $\frac{1}{6}$ ◯ 1

13. Which of the following expressions is sum of the series $1-x+x^2-x^3+...$ ◯ $\frac{1}{1+x}$ ◯ $\frac{1}{1-x}$ ◯ $\sqrt{1+x}$ ◯ $\frac{1}{\sqrt{1-x}}$

14. What is the length of the arc that subtends an angle of measure $60°$ at the centre of a circle with radius 6? ◯ 3π ◯ 2π ◯ 6π ◯ π

15. $\sin\left(\frac{7\pi}{6}\right)=$ ◯ $-\frac{\sqrt{3}}{2}$ ◯ $-\frac{1}{2}$ ◯ $\frac{1}{2}$ ◯ $\frac{\sqrt{3}}{2}$

16. Which of the following trigonometric expressions is identically equal to $1-\cos 2\theta$ ◯ $2\cos^2\theta$ ◯ $2\sin^2\theta$ ◯ $2\sin^2 2\theta$ ◯ $2\cos^2 2\theta$

17. What is the primary period of $\tan\left(\frac{x}{3}\right)$? ◯ 3π ◯ $\frac{\pi}{3}$ ◯ $\frac{\pi}{2}$ ◯ π

18. The circumradius R of a triangle with sides a,b,c is equal to: ◯ $\frac{abc}{\Delta}$ ◯ $\frac{abc}{4\Delta}$ ◯ $\frac{4abc}{\Delta}$ ◯ $\frac{4\Delta}{abc}$

19. For what value of x, $\tan(x-30°)=\cot x$ ◯ 90° ◯ 60° ◯ 120° ◯ 150°

20. What is the solution of $\sec x=2$ in the interval $[0,\pi]$? ◯ $\left\{-\frac{\pi}{6}\right\}$ ◯ $\left\{-\frac{\pi}{3}\right\}$ ◯ $\left\{\frac{\pi}{3}\right\}$ ◯ $\left\{\frac{\pi}{6}\right\}$

ROLL NUMBER					

MATHEMATICS HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B and C: 80**

NOTE: Attempt any twelve parts from Section 'B' and any four 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 48)

Q. 2 Attempt any TWELVE parts. All parts carry equal marks. **(12 x 4 = 48)**

(i) Simplify $\frac{9}{\sqrt{5}+\sqrt{-4}}$ in the form of $a+bi$

(ii) If U = the set of the English alphabets, A and B are subsets of U, where $A=\{x \mid x \text{ is a vowel}\}$, $B=\{y \mid y \text{ is a consonant}\}$, then verify the de Morgan's Laws (i) $(A\cup B)'=A'\cap B'$ (ii) $(A\cap B)'=A'\cup B'$

(iii) Construct the truth table for the biconditional $p\leftrightarrow q$

(iv) If $A=\begin{bmatrix}1 & 1+i & i\end{bmatrix}$, then find $\left(\overline{A}\right)' A$

(v) Without expansion, show that $\begin{vmatrix}2 & 3 & -1\\ 1 & 1 & 0\\ 2 & -3 & 5\end{vmatrix}=0$

(vi) Find the numerical value of k if polynomial x^3+kx^2-7x+6 has remainder 4 when divided by $x-2$

(vii) Find the two consecutive numbers whose product is 72

(viii) If $5, 8$ are two arithmetic means between a and b, then find a and b

(ix) Find $9th$ term of the hormonic sequence $-\frac{1}{5},-\frac{1}{3},-1,...$

(x) Find values of n and r, when ${}^nC_r=56$ and ${}^nP_r=336$

(xi) If x is so small that its square and higher powers can be neglected, then show that $\frac{\sqrt{4+x}}{(1+x)^3}\cong 2-\frac{23}{4}x$

(xii) Show that the area of a sector of a circular region of radius r is $\frac{1}{2}r^2\theta$, where θ is the circular measure of the central angle of the sector.

(xiii) If $\cot\theta=\frac{4}{3}$ and the terminal arm of the angle is not in the quadrant-I, find the values of $\cos\theta$ and $\operatorname{cosec}\theta$

(xiv) Show that $\frac{\cos(\pi+\theta)\sec(\pi-\theta)}{\sin^2(\pi+\theta)\cdot\tan(\pi-\theta)}=-\cot\theta\cdot\operatorname{cosec}^2\theta$

(xv) Prove that $\cot 2x=\frac{\sin x-\sin 3x}{\cos 3x-\cos x}$

(xvi) Show that $\tan^{-1}\left(\frac{27}{11}\right)-\tan^{-1}\frac{8}{19}=\frac{\pi}{4}$

SECTION – C (Marks 32)

Note: Attempt any FOUR questions. All questions carry equal marks. **(4 x 8 = 32)**

Q. 3 Solve the following system by reducing their augmented matrix to the echelon form

$$\begin{aligned}x_1+4x_2+2x_3&=2\\ 2x_1+x_2-2x_3&=9\\ 2x_1+2x_2-2x_3&=12\end{aligned}$$

Q. 4 Solve the system of simultaneous equations:

$$\begin{aligned}3x+2y&=7\\ 3x^2&=25+2y^2\end{aligned}$$

Q. 5 (a) Resolve $\frac{2x^4}{(x+3)(x-2)^2}$ into partial fractions

(b) Find the sum S_n of the Arithmetic Series $a+(a+d)+(a+2d)+...+(a+(n-1)d)$

Q. 6 Find the sum of the following series to n-terms: $1+(1+2)+(1+2+3)+...$

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

Q. 8 Without using calculator/table prove that $\sin 10°\sin 30°\sin 50°\sin 70°=\frac{1}{16}$