Model Paper Mathematic (HSSC-I)

Board: **F.B.I.S.E.** Time : **03 Hrs** Marks: **100**

Section – A (Marks: 20)

Q. 1. (a) Fill in the blanks. (5)

i) If $z = 2i+3$ then $|z| =$ ……

ii) $\sim q \rightarrow \sim p$ is called the Contrapositive of ……..

iii) The next two term of $7,9,12,16,.....$ are ……

iv) $0! =$ .....

v) $\tan\left(\frac{3\pi}{2}+\theta\right) =$ ……..

(b) Mark true or false by ✓ or ✗. (5)

i) ${}^nC_r = {}^nC_{n-r}$

ii) The identity element in a group is not unique.

iii) If $b^2 - 4ac = 0$ then the roots will be $\frac{-b}{2a}$ and $\frac{-b}{2a}$.

iv) $A - B = A \cup B^c$.

v) If $1 + \cos x = 0$ then $x = \pi + 2n\pi, \quad n \in \mathbb{Z}$.

(c) Pick up the right answer. (5)

i) $n(A \cap B) = 0$ if

(a) $A \cap B \neq 0$ (b) $A = B$ (c) $A \cap B = \varphi$ (d) None of them

ii) $\cos\alpha\cos\beta + \sin\alpha\sin\beta =$ .....= ……

(a) $\cos(\alpha+\beta)$ (b) $\sin(\alpha+\beta)$ (c) $\cos(\alpha-\beta)$ (d) $\sin(\alpha-\beta)$

iii) The Geometric Means between $-2i$ and $8i$ is

(a) $\pm 4i$ (b) ± 4 (c) 4 (d) None of them.

iv) $\sqrt{7}$ is a ……. number.

(a) Rational (b) Natural (c) Integer (d) Irrational

v) A square matrix A with complex entries, is called hermitian if $A =$ .....

(a) A^2 (b) $\left(\overline{A}\right)^t$ (c) $|A|$ (d) None of them.

(d) Find correct result from Column-I from Column-II and write in Column-III. (5)

Column-I	Column-II	Column-III
i) r_2	Period of $\tan x$	
ii) $\forall a,b \in \mathbb{R},\ ab = ba$	Group	
iii) π	$\frac{\Delta}{s-b}$	
iv) $\tan^{-1}(\sqrt{3})$	Commutative Law	
v) $(\mathbb{Z},+)$	$\frac{2\pi}{3}$	

Section – B (Marks: 40)

Q. 2. Without expansion prove that

$$\begin{vmatrix} bc & ca & ab \\ 1/a & 1/b & 1/c \\ a & b & c \end{vmatrix} = 0 \qquad (4)$$

OR

By the use of synthetic division, solve the equation $x^4 - 5x^2 + 4 = 0$ if -1 and 2 are its roots.

Q. 3. Show that $(1+\omega)(1+\omega^2)(1+\omega^4)(1+\omega^8).....2n \text{ factors} = 1$ (4)

OR

If the numbers $\frac{1}{k}, \frac{1}{2k+1}, \frac{1}{4k-1}$ are in harmonic sequence, find k.

Q. 4. Which term of A.P. $-2,4,10,.....$ is 148. (4)

OR

Find the general term in the expansion of $(1+x)^{-3}$ when $|x|<1$.

Q. 5. Find the smallest angle of the triangle ABC if $a = 37.34,\ b = 3.24,\ c = 35.06$ (4)

OR

Convert the following theorem to logical and prove them by constructing truth table

$$(A \cap B)' = A' \cup B'$$

Q. 6. Find the term involving x^4 in the expansion of $(3-2x)^7$ (4)

Q. 7. Convert 21.256° to the $D^\circ M' S''$ form.

Q. 8. Prove the identity;

$$\sqrt{\frac{1+\sin\alpha}{1-\sin\alpha}} = \frac{\sin\frac{\alpha}{2}+\cos\frac{\alpha}{2}}{\sin\frac{\alpha}{2}-\cos\frac{\alpha}{2}} \quad (4)$$

Q. 9. Prove that; $R = \dfrac{abc}{4\Delta}$ (4)

Q. 10. A ladder leaning against a vertical wall makes an angle of 24° with the wall. Its foot is $5m$ from the wall. Find its length? (4)

Q. 11. Without using calculator/table show that $\cos^{-1}\frac{4}{5} = \cot^{-1}\frac{4}{3}$. (4)

Section – C (Marks: 40)

Attempt any four Questions. (5+5 marks each)

Q. 12. **(a)** Find the rank of the matrix $\begin{pmatrix} 1 & -1 & 2 & -3 \\ 2 & 0 & 7 & -7 \\ 3 & 1 & 12 & -11 \end{pmatrix}$

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

Q. 13. **(a)** Solve the equations $\begin{cases} x^2 - y^2 = 5 \\ 4x^2 - 3xy = 18 \end{cases}$

(b) Resolve into partial fraction $\dfrac{x^2-10x+13}{(x-1)(x^2-5x+6)}$

Q. 14. **(a)** If α, β, γ are the angles of triangle ABC, prove that

$$\tan\frac{\alpha}{2}\cdot\tan\frac{\beta}{2} + \tan\frac{\beta}{2}\cdot\tan\frac{\gamma}{2} + \tan\frac{\gamma}{2}\cdot\tan\frac{\alpha}{2} = 1$$

(b) Sine is periodic function and its period is 2π. Prove it.

Q. 15. **(a)** Show that $2\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} = \frac{\pi}{4}$

(b) Find the solution set of the equation; $\cos 2x = \sin 3x$.

Q. 16. **(a)** If m and n are nearly equal, show that

$$\left[\frac{5m-2n}{3n}\right]^{\frac{1}{3}} \approx \frac{m}{m+2n} + \frac{n+m}{2n}.$$

(b) Find n A.Ms between a and b.

Q. 17. **(a)** Find the number of arrangement of 3 books on English and 5 books on Urdu for placing them on a shelf such that the books on the same subject are together.

(b) The sum of infinite geometric series is half the sum of the squares of its terms. If the sum of its first two terms is $9/2$. Find the series.

Q. 18. **(a)** Prove that $2\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} = \frac{\pi}{4}$

(b) $\sqrt{3}\tan x - \sec x - 1 = 0$