AJ&K BOARD HSSC-I

MODEL QUESTION PAPER (MATHEMATICS)

SECTION – A (Marks 20)

Time allowed: 25 Minutes (OBJECTIVE)

Q.1 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

1	Complex number $\frac{5+2i}{4-3i}$, in the form $a+ib$ is:							
	A	$\frac{-7}{25}+\frac{26}{25}i$	B	$\frac{5}{4}+\frac{2}{3}i$	C	$\frac{14}{25}+\frac{23}{25}i$	D	$\frac{26}{7}+\frac{23}{7}i$
2	What is the conjugate of $(1+i)^3$?							
	A	$-2+2i$	B	$-2-2i$	C	$2+2i$	D	$2-2i$
3	If det (A) = 5, then det (15 A) where A is of order 2 x 2							
	A	225	B	75	C	375	D	1125
4	What is the row rank of a matrix $\begin{bmatrix}1&3&5\\4&5&5\\1&2&2\end{bmatrix}$							
	A	0	B	1	C	2	D	3
5	If $\underline{a}=3\hat{i}-5\hat{j}$ and $\underline{b}=-2\hat{i}+3\hat{j}$, then the value of $\underline{a}+2\underline{b}$ is equal to							
	A	$\hat{i}+\hat{j}$	B	$-\hat{i}+\hat{j}$	C	$-\hat{i}-\hat{j}$	D	$\hat{i}-\hat{j}$
6	What is the angle between two non-zero vectors $\underline{a}$ and $\underline{b}$, if $\lvert\underline{a}\times\underline{b}\rvert=5$ and $\underline{a}\cdot\underline{b}=5\sqrt{3}$							
	A	30°	B	45°	C	60°	D	90°
7	The nth term of the sequence $\frac{1}{2},\frac{2}{3},\frac{3}{4},\frac{4}{5},\ldots$ is:							
	A	$\frac{1}{n+1}$	B	$\frac{n+1}{n}$	C	$\frac{n}{n+1}$	D	$\frac{n}{2n+1}$
8	If the nth term of an A.P is 4 n + 1, then the common difference is:							
	A	3	B	5	C	4	D	6
9	The nth term of the arithmetico – geometric series $\frac{0}{1}+\frac{1}{2}+\frac{2}{4}+\frac{3}{8}+\frac{4}{16}+\frac{5}{32}+\ldots$							
	A	2^{n-1}	B	$n2^{n+1}$	C	$\frac{2^{n-1}}{n}$	D	$n2^{n-1}$
10	$\frac{1}{6!}+\frac{2}{7!}+\frac{3}{8!}$ is equal to							
	A	$\frac{75}{8}$	B	$\frac{75}{8!}$	C	$\frac{75}{7!}$	D	$\frac{75}{6!}$
11	If $S=\{1,2,3,4,5,6\}$ be the sample space of rolling a die. What is the probability of rolling a number less than one							
	A	0	B	$\frac{1}{6}$	C	1	D	$\frac{1}{3}$
12	Which of the following is a correct option for the validity of $(3-5x)^{\frac{-1}{2}}$							
	A	$\lvert x\rvert<5$	B	$\lvert x\rvert<\frac{5}{3}$	C	$\lvert 5x\rvert<1$	D	$\lvert x\rvert<\frac{3}{5}$
13	If $f(x)=x^3-2$, then $f^{-1}(3)$ is equal to							
	A	7	B	$\sqrt[3]{7}$	C	$\sqrt[3]{5}$	D	$\sqrt[5]{3}$
14	Which of the following is a point in the feasible region determined by the linear inequalities $2x+3y\le 6$ and $3x-2y\le 16$?							
	A	(4,3)	B	(3,−2)	C	(−2,4)	D	(3,−4)
15	If $sin\,\theta=\frac{5}{13}$ and terminal ray of θ in second quadrant, then $cos\,\theta=$							
	A	$-\frac{12}{13}$	B	$\frac{12}{13}$	C	$\frac{13}{12}$	D	$-\frac{13}{12}$
16	$cos\,50°\,50'\,cos\,9°\,10'-sin\,50°\,50'\,sin\,9°\,10'=$							
	A	0	B	$\frac{1}{2}$	C	1	D	$\frac{\sqrt{3}}{2}$
17	Which of the following represents $\left(sin\frac{\alpha}{2}\right)\left(cos\frac{\alpha}{2}\right)$							
	A	$\frac{\Delta}{a^3}$	B	$\frac{\Delta}{ac}$	C	$\frac{\Delta}{bc}$	D	$\frac{\Delta}{abc}$
18	In triangle ABC (with usual notation) if $a=\sqrt{3}, b=3$ and $\beta=60°$, then value of α is:							
	A	30°	B	45°	C	60°	D	75°
19	Find the period of $5\,tan\,\frac{1}{2}x$ is:							
	A	2π	B	π	C	5π	D	$\frac{5\pi}{2}$
20	$sin\left[cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right]$ is equal to							
	A	$\frac{\sqrt{3}}{2}$	B	$\frac{1}{\sqrt{2}}$	C	$-\frac{1}{2}$	D	$\frac{1}{2}$

AJ&K BOARD HSSC-I

MODEL QUESTION PAPER (MATHEMATICS)

(SUBJECTIVE PART)

Time allowed: 2:35 hours **Total Marks Section B and C : 80**

SECTION – B (Marks 48)

Q2. Attempt any TWELEVE parts. All parts carry equal marks. (12 x 4 = 48)

i. If $z_1 = 2 - i$ and $z_2 = 1 + i$, then evaluate $\left|\frac{z_1+z_2+1}{z_1-z_2+1}\right|$.

ii. Show that $\bar{z} = -z$ if and only if z is pure imaginary.

iii. Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c})$

iv. Find a unit vector perpendicular to both $\underline{a} = \hat{\imath} + \hat{\jmath} + 2\hat{k}$ and $\underline{b} = -2\hat{\imath} + \hat{\jmath} - 3\hat{k}$.

v. The arithmetic mean of two numbers is 8, and the harmonic mean is 6. What are the numbers?

vi. Sum the series $3.1^2 + 5.2^2 + 7.3^2 + \ldots$ to n terms.

vii. Find n and r if ${}^nP_r = 840$ and ${}^nC_r = 35$.

viii. Three unbiased coins are tossed. What is the probability of obtaining at least one head?

ix. Using Principal of Mathematical Induction, prove that:

$$1 + 2 + 2^2 + 2^3 + \ldots + 2^{n-1} = 2^n - 1.$$

x. Find the domain and range of $f^{-1}(x)$ if $f(x) = \frac{x-4}{x-3}$.

xi. Graph the system of linear inequalities

$$2x + y \geq 4 \quad ; \quad x + y \geq 3 \quad ; \quad x \geq 0$$

xii. Show that $\sin(\alpha + \beta)\sin(\alpha - \beta) = \cos^2\beta - \cos^2\alpha$.

xiii. Find area of a triangle ABC (with usual notations) if:

(a) $b = 40, \alpha = 50°, \gamma = 60°$

(b) $a = 11, b = 9.0, c = 8.0$

xiv. In triangle ABC (with usual notations), prove that : $\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} = \frac{1}{r}$

xv. Verify that: $2\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(-\frac{1}{7}\right) = \frac{\pi}{4}$

xvi. Find the solution set of $\sin x \cos x = \frac{\sqrt{3}}{4}$

SECTION – C (Marks 32)

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

Q3. Solve the following system of non-homogeneous linear equations using GAUSS JORDAN method.

$$x + y + z = 4 \quad ; \quad 2x - 3y + z = 2 \quad ; \quad -x + 2y - z = -1$$

Q4. (a) Show that the sum of the first n positive odd integers is n^2.

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

Q5. If $2y = \frac{1}{2^2} + \frac{1.3}{2\,!} \cdot \frac{1}{2^4} + \frac{1.3.5}{3\,!} \cdot \frac{1}{2^6} + \ldots$ then prove that $4y^2 + 4y - 1 = 0$

Q6. Find the maximum and minimum values of the function Z = 7 x + 21 y subject to the constraints:

$$2x + y \geq 2 \quad ; \quad 2x + 3y \leq 6 \quad ; \quad x + 2y \leq 8 \quad ; \quad x \geq 0 \quad ; \quad y \geq 0$$

Q7. Prove that $\cos 20° \cos 40° \cos 60° \cos 80° = \frac{1}{16}$

Q8. Prove that $\sin^{-1}\frac{4}{5} + \sin^{-1}\frac{5}{13} - \sin^{-1}\frac{16}{65} = \frac{\pi}{2}$

NOTE: SLO based questions are taken from chapters 02, 07 and 11.