# HSSC-I Annual 2019

**Subject:** Mathematics **Total Marks:** 100

Federal Board of Intermediate and Secondary Education, Islamabad

**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.

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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 range of $y = sin^{-1}x$?

   (A) $\frac{-\pi}{4} < y < \frac{\pi}{2}$ (B) $0 < y < \pi$ (C) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$ (D) $0 \leq y \leq \pi$

2. What is the general solution of $\sin x = 0$ in $\mathbb{R}$

   (A) $\{\pm\frac{n\pi}{2} : n \in Z\}$ (B) $\{\pm\frac{3n\pi}{2} : n \in Z\}$ (C) $\{\pm n\pi : n \in Z\}$ (D) $\{\pm 2n\pi : n \in Z\}$

3. Under which of the following operations, the set $\S = \{-1, 0, 1\}$ is closed?

   (A) Multiplication (B) Division (C) Addition (D) Subtraction

4. Which of the following sets is equal to $\{x \in Q : x^2 = 2\}$

   (A) $\{\}$ (B) $Q$ (C) $\{\pm\sqrt{2}\}$ (D) $\{\pm 1\}$

5. Which of the following binary relations from $A\{1, 2, 3\}$ to $B = \{a, b, c\}$ is a function?

   (A) $\{(1, a), (2, c), (2, b)\}$ (B) $\{(1, a), (2, b), (1, c)\}$ (C) $\{(1, a), (1, b)(2, c), (3, c)\}$ (D) $\{(1, a), (2, a), (3,$

6. Let $A$ and $B$ be the square matrices of the same order.Which of the following is true about $A$ and $B$?

   (A) $\det(A) = \det(B)$ (B) $\det(AB) = \det((AB)')$ (C) $\det(A + B) = \det(A) + \det(B)$
   (D) $\det(AB) = \det(BA)$

7. If two roots of a cubic equation are 0 and $i$, then the cubic equation is:

   (A) $x^3 - x = 0$ (B) $x^3 - 1 = 0$ (C) $x^3 + 1 = 0$ (D) $x^3 + x = 0$

8. What could be a prtial fractions of $\frac{x^2+2x+4}{(x-2)(x^3-8)}$?

   (A) $\frac{A}{x+2} + \frac{B}{(x-2)^2} + \frac{C}{x^2-2x+4}$ (B) $\frac{A}{x+2} + \frac{B}{(x-2)^2} + \frac{Cx+D}{x^2+2x+4}$ (C) $\frac{A}{x-2} + \frac{B}{(x-2)^2} + \frac{Cx+D}{x^2-2x+4}$
   (D) $\frac{A}{x-2} + \frac{B}{(x-2)^2} + \frac{Cx+D}{x^2+2x+4}$

9. What is the sum of $n$ term of the sequence with $n^{th}$ term $a_n = 4n + 1$?

   (A) $2n(2n + 3)$ (B) $n(2n + 3)$ (C) $2n + 3$ (D) $4n + 6$

10. What is the sum of the series $1 + \frac{1}{3} + \frac{1}{9} + .....?$

    (A) $\frac{3}{4}$ (B) $\frac{3}{2}$ (C) 3 (D) $\frac{4}{3}$

11. If a fair die is rolled, then what is the probability that the top is a prime number?

    (A) $\frac{2}{5}$ (B) $\frac{3}{2}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$

12. For what value of $x$, the binomial expansion of $\left(2 - \frac{x}{2}\right)^{-1}$ is valid?

    (A) $|x| > 4$ (B) $|x| > 2$ (C) $|x| < 4$ (D) $|x| < 2$

13. How many lines can be drawn between the five points in the plane?

    (A) 120 (B) 60 (C) 20 (D) 10

14. Which term is the middle term in the expansion of $\left(x - \frac{2}{x}\right)^2 n$?

    (A) $(n-1)^{th}\, term$ (B) $\left(\frac{n}{2} - 1\right)^{th}\, term$ (C) $\left(\frac{n}{2} + 1\right)^{th}\, term$ (D) $(n+1)^{th}\, term$

15. The radian measurement of the central angle of a circle of radius $6cm$ which cut off an arc of $12cm$ long is :

    (A) 3 (B) 4 (C) 1 (D) 2

16. Which of the following identities is true?

    (A) $\sin 3\theta = 3\sin\theta + 4\sin^3\theta$ (B) $\sin 3\theta = 4\sin\theta + 3\sin^3\theta$ (C) $\cos 3\theta = 4\cos^3\theta + 3\cos\theta$
    (D) $\cos 3\theta = 4\cos^3\theta - 3\cos\theta$

17. Which of the following is equal to $\cos\left(\frac{3\pi}{2} - x\right)$?

    (A) $\sin x$ (B) $\cos x$ (C) $-\cos x$ (D) $-\sin x$

18. What is primary period of $\frac{1}{2}\sin 2x$?

    (A) $2\pi$ (B) $\frac{\pi}{2}$ (C) $4\pi$ (D) $\pi$

19. In a right angle triangle $ABC$, If the lengths of two non-perpendicular sides are 5 and 3, then what will be the length of the third side?

    (A) 4 (B) $\sqrt{34}$ (C) 3 (D) 4.5

20. If $R$ is circumradius of a triangle $ABC$, Then $R =$

    (A) $\frac{abc}{4\triangle}$ (B) $\frac{4\triangle}{abc}$ (C) $\frac{abc}{\triangle}$ (D) $\frac{abc}{4}$

ANSWERS

1. C 2. C 3. A 4. A 5. D 6. D 7. D 8. D 9. B 10. B 11. C
12. C 13. D 14. D 15. D 16. D 17. D 18. D 19. A 20. A

## Section–B

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

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| **(i)** Express the complex number $1+i\sqrt{3}$ in polar form. | Ch#1, Example 4, Pag#25 |
| **(ii)** Show that $(A\cup B)' = A'\cup B'$ (Demorgan law). Where $A$ and $B$ are subsets of a universal set $U$. | Ch#2, Pag#42 (vii) |
| **(iii)** If $a,b$ are elements of a group $G$ under the operation of multiplication. Then show that $(ab)^{-1} = b^{-1}a^{-1}$. | Ch#2, Pag#77 |
| **(iv)** If $A=\left[a_{ij}\right]_{3\times 3}$ and $\lambda \in R$, then show that $\lambda A - A = (\lambda - 1)A$ | Ch#3, Ex 3.1, Q#6(iii) |
| **(v)** Determine whether $p\to(q\to p)$ is a tautology, a contingency or an absurdity. | Ch#2, Ex 2.4, Q#4(ii) |
| **(vi)** Discuss the nature of roots of $2x^2-5x+1=0$. | Ch#4, Ex 4.7, Q#3(i) |
| **(vii)** If a number exceeds its square root by $56$. Find the number. | Ch#4, Ex 4.10, Q#5 |
| **(viii)** Find the $13th$ term of the sequence $x,1,2-x,3-2x,.....$ | Ch#6, Ex 6.2, Q#4 |
| **(ix)** Find the sum of $n$ term of the series whose $n^{th}$ term is $3n^2+n+1$. | Ch#6, Ex#6.11, Q#15(i) |
| **(x)** A box contains $10$ red, $30$ white and $20$ back marbles. A marble is drawn at random. Find the probability that it is either red or white. | Ch#7, Ex 7.7, Q#2 |
| **(xi)** If $x$ is so small that its square and higher powers can be neglected, then show that $\dfrac{\sqrt{4+x}}{(1+x)^3}\cong 2+\dfrac{25}{4}x$ | Ch#8, Ex#8.3, Q#4(iv) |
| **(xii)** Prove that $\dfrac{\sin^2(\pi+\theta)\tan\left(\dfrac{3\pi}{2}+\theta\right)}{\cot^2\left(\dfrac{3\pi}{2}-\theta\right)\cos^2(\pi-\theta)\operatorname{cosec}(2\pi-\theta)}=\cos\theta$ | Ch#10, Ex#10.1, Q#4(i) |
| **(xiii)** If a triangle $ABC$ is with $a=\sqrt{3}-1$, $b=\sqrt{3}+1$ and $\gamma=60^\circ$, then find $c$. | Ch#12, Ex#12.5, Q#3 |
| **(xiv)** Without using calculator or table, prove that $2\tan^{-1}\dfrac{1}{3}+\tan^{-1}\dfrac{1}{7}=\dfrac{\pi}{4}$. | Ch#13, Ex#13.2, Q#12 |

## Section C (40 Marks (5×8 each))

***Note:*** *Attempt any* ***Five*** *questions. Graph paper will be supplied on demand.*

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|---|---|
| **Q # 3** Find the value of $\lambda$ for which the system:<br>$x+y+z=0$<br>$2x+y-\lambda z=0$ has a non-trivial solution. Also solve<br>$x+2y-2z=0$<br>the system. | Ch#3, Ex 3.5, Q#5(i) |
| **Q # 4** Show that roots of $x^2+(mx+c)^2=a^2$ will be equal if $c^2=a^2(1+m^2)$ | Ch#4, Ex 4.7, Q#5 |

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| **Q # 5** Sum the following series to $n$ terms: $\frac{1^2}{1}+\frac{1^2+2^2}{2}+\frac{1^2+2^2+3^2}{3}+\ldots$ to $n$ terms. | Ch#6, Ex 6.11, Q#13(iii) |
| **Q # 6** By the principal of mathematical induction, show that $x+y$ is a factor of $x^{2n-1}+y^{2n-1}\,(x\neq -y)$, for all positive integer $n$. | Ch#8, Ex 8.1, Q#27 |
| **Q # 7** Without using calculator or table, prove that $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$. | Ch#10, Ex10.4, Q#5(iii) |
| **Q # 8** In triangle $ABC$, with usual notation, prove that: Area of triangle $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ (The Hero's formula) | Ch#12, Pg#375, case III |
| **Q # 9** Solve the trigonometric equation $\cos\theta+\cos 3\theta+\cos 5\theta+\cos 7\theta=0$ for its general solution. | Ch#14, Ex 14, Q#20 |