

H.S.C Annual Examinations 2021
MATHEMATICS PAPER I (MODEL PAPER)
(Science Pre-engineering & Science General Group)

SECTION "A" (Short- Answers Question)

Time: 30 minutes

Max.marks:50

NOTE: This section consists of 25 part questions and all are to be answered.

Q1. Select the correct answer from the given options.

i. The in radius r of triangle ABC is equal to

- a. $s\Delta$
- b. $\frac{\Delta}{s}$
- c. $\frac{s}{\Delta}$
- d. $\frac{\Delta}{s-a}$

ii. The number of ways in which 5 persons can be seated in a row is

- a. 120
- b. 24
- c. 6
- d. Infinite

iii. If $|x| < 1$ then $1 + 2x + 3x^2 + 4x^3 + \dots =$

- a. $(1+x)^{-1}$
- b. $(1-x)^{-1}$
- c. $(1+x)^{-2}$
- d. $(1-x)^{-2}$

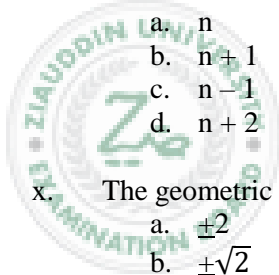
iv. $(A \cap A')$ is equal to

- a. U
- b. ϕ
- c. $\{\phi\}$
- d. A'

v. If I is an imaginary number then i^{33}

- a. I
- b. $-i$
- c. 1
- d. $-i$

- vi. If $z = -3i + 2$, then $z + \hat{z} =$
- $6i$
 - 6
 - 0
 - 4
- vii. The sum of the roots of the equation $y^2 - 2y + 8 = 0$
- 2
 - 4
 - 8
 - -8
- viii. $\binom{6}{2,3}$ is equal to
- 1
 - 60
 - 120
 - 240
- ix. The total number of terms in the expansion of $(a+b)^n$ ($n \in \mathbb{N}$) is
- n
 - $n + 1$
 - $n - 1$
 - $n + 2$
- x. The geometric means between 2 and $\frac{1}{2}$ are equal to
- ± 2
 - $\pm\sqrt{2}$
 - $\pm\frac{1}{\sqrt{2}}$
 - ± 1
- xi. $\sum n$ is equal to
- $\frac{n(n+1)}{2}$
 - $\frac{n(n+1)}{4}$
 - $\frac{n(n+1)(2n+1)}{6}$
 - $\frac{n^2(n+1)}{3}$
- xii. If $1, x - 1, 3$ are in A.P then $x =$
- 2
 - 1
 - $-2, 4$
 - 3



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xiii. The number of permutations of the letters of the word COMMITTEE is

- a. $\binom{9}{2\ 2\ 2}$
- b. $\binom{6}{2\ 2\ 2}$
- c. $\binom{9}{2\ 2\ 1}$
- d. $\binom{222}{9}$

xiv. If arc length S is equal to the radius r , then the central angle θ is

- a. 0 radian
- b. $\frac{1}{2}$ radian
- c. 2 radian
- d. 1 radian

xv. In a triangle ABC if $\gamma = 90^\circ$ then the law of cosine reduces to

- a. $a^2 = b^2 + c^2$
- b. $b^2 = a^2 - c^2$
- c. $c^2 = a^2 + b^2$
- d. $c^2 = a^2 - b^2$

xvi. If $r \cos \theta = 4$ and $r \sin \theta = 3$ then $r =$

- a. 3
- b. 5
- c. 6
- d. 2

xvii. A coin tossed thrice. The probability of getting three tail is

- a. $\frac{1}{2}$
- b. $\frac{3}{2}$
- c. $\frac{1}{8}$
- d. $\frac{2}{3}$

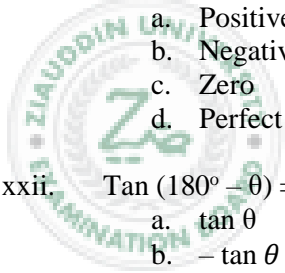
xviii. $1 - 2 \sin^2 \frac{\theta}{2}$ is equal to

- a. $\sin \theta$
- b. $\cos \theta$
- c. $\sin \frac{\theta}{2}$
- d. $\cos \frac{\theta}{2}$

xix. The angle 135° in radians is

- a. $\frac{5\pi}{4}$
- b. $\frac{3\pi}{4}$
- c. $\frac{2\pi}{4}$
- d. 135π

- xx. The period of $\sin x$ is
- $\pi/2$
 - π
 - $-\pi$
 - 2π
- xxi. If roots of the equation $ax^2 + bx + c = 0$ are real then $b^2 - 4ac$ is
- Positive
 - Negative
 - Zero
 - Perfect square
- xxii. $\tan(180^\circ - \theta) =$
- $\tan \theta$
 - $-\tan \theta$
 - $\cot \theta$
 - $-\cot \theta$
- xxiii. If ω is a complex cube of unity then $(1 + \omega + \omega^2)^2$ will be equal to
- 0
 - 1
 - 4
 - ω^2
- xxiv. $1/1 + \tan^2 \theta$
- $\sec^2 \theta$
 - $\cos^2 \theta$
 - $\sin^2 \theta$
 - $\cot^2 \theta$
- xxv. Area of a triangle ABC is
- $\frac{1}{2} ab \sin \beta$
 - $\frac{1}{2} bc \sin \alpha$
 - $\frac{1}{2} ac \sin \gamma$
 - $\frac{1}{2} bc \sin \beta$



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SECTION “B” (Short- Answers Question)

(30 marks)

Time: 1hour 30 minutes

NOTE: Attempt any THREE questions from this section. All questions carry equal marks.

2.

(a) If $z_1 = 1 + i$ and $z_2 = 3 - 2i$, find the value of $|5z_1 - 4z_2|$ and $\frac{z_1}{z_2}$

(b) Show that the multiplication is a binary operation on $S = \{1, -1, i, -i\}$ is multiplication commutative and associative in S ?

3.

(a) If α and β are the roots of given $px^2+qx+r=0$, form an equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$.

(b) If a point on the rim of a 21cm,diameter fly wheel travels 5040 meters in a minute,through how many radians does the wheel turn in a second?

4.

(a) Solve $\sin \theta + \cos \theta = 1$

(b) Prove by mathematical induction that $2 + 6 + 12 + \dots + n(n+1) = \frac{1}{3} n(n+1)(n+2)$

5.

(a) Write in the simplified form the term independent of x in $(x-2/x)^{10}$

(b) How many different arrangements can be made by using all the letters of the word

“MATHEMATICS” how many of them begin with “C”? How many of them begin with T? in how many of them consonants will occur together?

6.

(a) Prove that. (any TWO)

(i) $\cos 3\theta = 4\cos^3 \theta - 3\cos \theta$

(ii) $\sin(\theta + \phi)\sin(\theta - \phi) = \sin^2 \theta - \sin^2 \phi$

(iii) $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = 2$

(b) Prove that $\frac{1}{r^2} + \frac{1}{r1^2} + \frac{1}{r2^2} + \frac{1}{r3^2} = \frac{a^2 + b^2 + c^2}{\Delta^2}$

Section “C” (Detailed – Answer Questions). (20 marks)

NOTE: Attempt two questions from this section including question number 7 which is compulsory.

7.

(a) The sum of four terms in an A. P is 4. The sum of the products of the first and last terms and of two middle terms is -38 . Find the numbers.

(b) Find the value of “n” so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may become the G.M b/w a and b.

$$a^n + b^n$$

Q.6

(a) If $y = \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$. Prove that $y^2 + 2y - 7 = 0$.

(b) Derive the law of cosine

Q7.

(a) Solve the equation

$$4x + 3t = 25$$

$$\frac{4}{x} + \frac{3}{t} = 2$$

(b) If α, β are the roots of $pt^2 + qt + r = 0$ prove that

$$\sqrt{\frac{q}{p}} + \sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} = 0$$