

Reg. No. :

Name :

FIRST YEAR HIGHER SECONDARY EXAMINATION, JUNE 2022

Part – III

Time : 2 Hours

MATHEMATICS (SCIENCE) Cool-off time : 15 Minutes

Maximum : 60 Scores

General Instructions to Candidates :

- There is a 'Cool-off time' of 15 minutes in addition to the writing time.
- Use the 'Cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

വിദ്യാർത്ഥികൾക്കുള്ള പൊതുനിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

Answer any 6 questions from 1 to 8. Each carries 3 scores.

(6 × 3 = 18)

1. (i) If A is any set, then $A \cap A' =$ _____
- (a) A
(b) ϕ
(c) A'
(d) U (1)
- (ii) $A = \{x : x \text{ is a natural number less than } 3\}$
- (a) Write A in roster form. (1)
(b) Write all the subsets of A. (1)
2. (i) $25^\circ =$ _____ radian. (1)
- (ii) If $\tan x = \frac{5}{12}$, x lies in 3rd quadrant, then find the value of $\sin x$ and $\cos x$. (2)
3. (i) For what values of x, the numbers $\frac{4}{3}$, x, $\frac{3}{4}$ are in Geometric progression? (1)
- (ii) Find the nth term of the Geometric Progression : (2)
- $\sqrt{3}, 3, 3\sqrt{3}, \dots$
4. Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$. (3)
5. (i) Focus of the parabola $y^2 = 8x$ is _____
- (a) (4, 0) (b) (0, 2)
(c) (0, -4) (d) (2, 0) (1)
- (ii) Find the centre and radius of the circle $x^2 + y^2 + 6x - 4y - 3 = 0$. (2)

6. Find the ratio in which the yz - plane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$. (3)

7. Evaluate the following limits :

(i) $\lim_{x \rightarrow 2} x^2 - 4$ (1)

(ii) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ (1)

(iii) $\lim_{x \rightarrow 0} \frac{\sin 4x}{x}$ (1)

8. Prove by the method of contradiction that $\sqrt{3}$ is irrational. (3)

Answer any 6 questions from 9 to 17. Each carries 4 scores.

(6 × 4 = 24)

9. (i) Which one of the following is equal to $\{x : x \in \mathbb{R}, -4 < x \leq 5\}$?

(a) $(-4, 5]$

(b) $(-4, 5)$

(c) $[-4, -5]$

(d) $[-4, 5)$ (1)

(ii) If $U = \{1, 2, 3, 4, 5, 6, 7\}$, $A = \{2, 3, 4, 6\}$, $B = \{3, 4, 5\}$, then verify that

$(A \cup B)' = A' \cap B'$. (3)

10. (i) Let $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$. A relation R from A to A is defined by $R = \{(x, y) :$

$2x - y = 0$ where $x, y \in A\}$. Write down its domain and range. (2)

(ii) Draw the graph of the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = |x| + 1$. (2)

11. Consider the statement :

$$P(n) : \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots + \frac{1}{2^n} = 1 - \frac{1}{2^n}$$

(i) Show that $P(1)$ is true. (1)

(ii) Prove by principle of Mathematical Induction that $P(n)$ is true for all $n \in \mathbb{N}$. (3)

12. (i) If ${}^nC_9 = {}^nC_8$, then $n =$ _____ (1)

(ii) ${}^nP_r =$ _____ (1)

(iii) Find the number of permutations using all the letters of the word
"MATHEMATICS". (2)

13. Consider the expansion of $(x + 9y)^{10}$. Find its

(i) number of terms (1)

(ii) general term (2)

(iii) 5th term (1)

14. Find the sum of the sequence 8, 88, 888, to n terms. (4)

15. (i) Find the slope of the line $x - 7y + 5 = 0$. (1)

(ii) Find the equation of the line perpendicular to the above line having x - intercept 3. (3)

16. Find the co-ordinates of the foci, vertices, the length of the major axis and the length of the latus rectum of the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$. (4)

17. If A and B are two events such that $P(A) = 0.54$, $P(B) = 0.69$ and $P(A \cap B) = 0.35$, then find

(i) $P(A \text{ or } B)$ (2)

(ii) $P(\text{not } A \text{ and not } B)$ (2)

Answer any 3 questions from 18 to 22. Each carries 6 scores.

(3 × 6 = 18)

18. (i) Prove that :

$$\frac{\cos 9x - \cos 5x}{\sin 17x - \sin 3x} = \frac{-\sin 2x}{\cos 10x} \quad (3)$$

- (ii) Find the principal and general solution of the equation $\sin x = \frac{-\sqrt{3}}{2}$. (3)

19. (i) Represent the complex number $Z = -1 + i\sqrt{3}$ in the polar form. (3)

- (ii) Solve the equation $\sqrt{5}x^2 + x + \sqrt{5} = 0$. (3)

20. (i) Solve the inequality $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$. (2)

- (ii) Solve the following inequalities graphically :

$$x + 3y \leq 9$$

$$2x + y \leq 12$$

$$x \geq 0 ; y \geq 0$$

(4)

21. (i) Find the derivative of $\cos x$ using first principle. $-\sin x$ (3)

(ii) Find the derivative of $\frac{x^2}{3x-1}$. (3)

22. Consider the following table :

Classes	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
frequencies	6	8	14	16	4	2

(i) Find the mean. (2)

(ii) Find the variance. (3)

(iii) Find the standard deviation. (1)