FY-427

Reg. No. : .....

Name : .....

FIRST YEAR HIGHER SECONDARY EXAMINATION, MARCH – 2024

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 നല്കിയിട്ടുണ്ട്.
- 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. $(6 \times 3 = 18)$

1. (i) If $A = \{1, 2, 3\}$ and $B = \{1, 4\}$, then the number of subsets of $A \times B$ is (1)

   (a) 5^2 (b) 6^2

   (c) 2^5 (d) 2^6

   (ii) If $\left(\frac{x}{3}+1, y-\frac{2}{3}\right)=\left(-\frac{2}{3}, \frac{2}{3}\right)$, then find x and y. (2)

2. (i) $\cos(x+y) + \cos(x-y) =$ _____. (1)

   (ii) Prove that $\cos\left(\frac{3\pi}{4}+x\right) + \cos\left(\frac{3\pi}{4}-x\right) = -\sqrt{2}\cos x$. (2)

3. (i) Solve the inequality $x + \frac{x}{2} + \frac{x}{3} \leq 10 + \frac{x}{6}$. (2)

   (ii) Mark the solution in a number line. (1)

4. (i) ${}^nC_r =$ _____. (1)

   (a) $\frac{n!}{r!}$ (b) $\frac{n!}{(n-r)!}$

   (c) $\frac{n!}{r!(n-r)!}$ (d) $\frac{n(n-1)}{r!}$

   (ii) In how many ways a committee consisting of 3 men and 2 women, can be chosen from 7 men and 5 women ? (2)

5. (i) Sum of all coefficients in the Binomial expansion of $(1+x)^n$ is _____. (1)

   (ii) Using Binomial theorem expand $\left(\frac{x}{3}+\frac{3}{x}\right)^4$. (2)

6. Consider the line $L_1 : 3x - 4y + 12 = 0$ and a point $A(2, -3)$.

   (i) Find the equation of the line passing through A and parallel to the given line L_1. (2)

   (ii) Find the distance from the origin to the given line L_1. (1)

7. Find the coordinates of focus, equation of directrix and length of latus rectum of the parabola $x^2 = 12y$.

8. (i) $\lim_{x \to a} \frac{x^n - a^n}{x - a} =$ _____. (1)

(ii) If $\lim_{x \to 2} \frac{x^n - 2^n}{x - 2} = 32$, then find the value of n. (2)

Answer any 6 questions from 9 to 16. Each carries 4 scores. **(6 × 4 = 24)**

9. (i) $A \cap A' =$ _____. (1)

(ii) If U = {1, 2, 3, 4, 5, 6}, A = {2, 3, 4} and B = {2, 3, 4, 6}, then verify that $(A \cap B)' = A' \cup B'$. (3)

10. (i) Draw the graph of the function, $f : \mathbb{R} - \{0\} \to \mathbb{R}$ defined by $f(x) = \frac{1}{x}$. (2)

(ii) Find the domain and range of $f(x) = \sqrt{9 - x^2}$. (2)

11. (i) Express $(1 - i)^6$ in $x + iy$ form. (2)

(ii) Find the coordinates that represent the complex number $\frac{1 - i}{1 + i}$ in the argand plane. (2)

12. (i) If ${}^nP_r = 840$ and ${}^nC_r = 35$, then find the value of r. (2)

(ii) Find the number of permutations of the letters of the word ATTITTUDE. (2)

13. The vertices of ΔPQR are P(1, 0), Q(5, 4) and R(–1, 4).

(i) Find the equation of the line representing the side PQ. (2)

(ii) Find the equation of the line through R and perpendicular to the side PQ. (2)

14. An ellipse has its foci on (± 4, 0) and vertices at (± 5, 0)

(i) Find the length of the minor axis. (1)

(ii) Find the length of the latus rectum and eccentricity of the ellipse. (2)

(iii) Also write the equation of the ellipse. (1)

15. (i) Give an example of any one point which lie in second octant. (1)

(ii) Show that the points A(0, 7, 10), B(–1, 6, 6) and C(–4, 9, 6) are the vertices of a right angled triangle. (3)

16. A bag contains 8 red and 5 white balls. Three balls are drawn at random. Find the probability that

(i) All the three balls are white (1)

(ii) All the three balls are red (1)

(iii) One ball is red and two balls are white (2)

Answer any 3 questions from 17 to 20. Each carries 6 scores. $(3 \times 6 = 18)$

17. (i) $\frac{1-\tan^2 15^\circ}{1+\tan^2 15^\circ} =$ _____. (1)

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{\sqrt{3}}{2}$

(c) 2 (d) $\sqrt{3}$

(ii) Prove that $\frac{\sin 3x - \sin x}{\cos^2 x - \sin^2 x} = 2 \sin x$. (2)

(iii) If $\tan \theta = \frac{1}{2}$ and $\tan \phi = \frac{1}{3}$, then show that $\theta + \phi = \frac{\pi}{4}$. (3)

18. (i) Which term of the G.P. 2, 8, 32, ... is 32768 ? (2)

(ii) The sum of first three terms of a G.P. is 14 and sum of next three terms is 112. Find the common ratio, first term and the sum to first n terms of the G.P. (4)

19. (i) Using first principle find the derivative of $f(x) = \frac{1}{x}$. (3)

(ii) Find $\frac{d}{dx}\left(\frac{x^2+1}{x^2-1}\right)$. (3)

20. (i) Find the mean deviation about mean of the following data : (2)

4, 7, 8, 9, 10, 12, 13, 17.

(ii) Find the variance of the following frequency data : (4)

Class	4 – 8	8 – 12	12 – 16	16 – 20
Frequency	3	6	4	7