Reg. No. : .....

Name : .....

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FIRST YEAR HIGHER SECONDARY MODEL EXAMINATION, FEBRUARY 2024
Part – III
MATHEMATICS (SCIENCE)
Maximum : 60 Scores

Time : 2 Hours
Cool-off Time : 15 Minutes

General Instructions to Candidates :

- *There is a 'Cool off time' of 15 minutes in addition to the writing time.*
- *Use 'cool off time' to get familiar with questions and to plan your answers.*
- *Read questions carefully before answering.*
- *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 മിനിട്ട് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ 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.

Score

Answer any 6 questions from 1 to 8. Each carries 3 scores. **(6×3=18)**

1. Consider the sets A = {−1, 1}, B = {0, 2, 3}

   i) Write A × B. **(1)**

   ii) Write the number of relations from A to B. **(1)**

   iii) Write all subsets of B. **(1)**

2. i) In which interval that f(x) = cos x increases from −1 to 0.

   A) $\left[0, \pi/2\right]$ B) $\left[\pi/2, \pi\right]$

   C) $\left[\pi, \frac{3\pi}{2}\right]$ D) $\left[\frac{3\pi}{2}, 2\pi\right]$ **(1)**

   ii) If $\sin x = \frac{3}{5}$, x lies in the second quadrant write the value of cos x. **(1)**

   iii) Write the degree measure of $\frac{5\pi}{3}$. **(1)**

3. Solve the inequality $\frac{4-3x}{2} \geq \frac{1-x}{4} - 2$. **(3)**

4. i) Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination. **(2)**

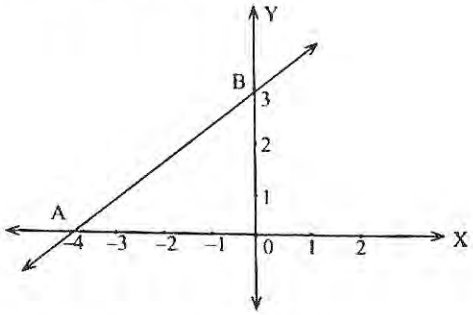
   ii) If ${}^{n}C_4 = {}^{n}C_6$, ${}^{n}C_8 =$ _____. **(1)**

5. i) Write the number of terms in the expansion of $(x + 2y)^{2n}$, $n \in N$ **(1)**

   ii) Expand $\left(x + \frac{3}{x}\right)^4$, $x \neq 0$. **(2)**

Score

6. Consider the figure given below :



i) Find the equation of line AB. (1)

ii) Find the distance of the origin from the line AB. (2)

7. Find the equations of the circles with radius 5 units whose centre lies on x-axis and passes through the point (2, 3). (3)

8. i) $\lim_{x \to 0}\left(\frac{\sin x}{x}\right) =$ _____

A) 1

B) –1

C) 0

D) not defined (1)

ii) Evaluate $\lim_{x \to 0}\left(\frac{1-\cos x}{\sin x}\right)$ (2)

Score

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

9. i) Write the set builder form of the interval $(-1, 3]$. **(1)**

ii) Let U be the Universal set and A be a subset of U, then $A \cap A' =$

(A) A (B) $\varnothing$ (C) U (D) A' **(1)**

iii) Let $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and $B = \{3, 4, 5\}$. Find $A \cup B$, $B - A$, $A \cap B$ and $(A \cup B)'$. **(2)**

10. i) Draw the graph of the function $f(x) = 3 - |x|$. **(2)**

ii) Write the range of $f(x)$. **(1)**

iii) Write the domain of the function $\sqrt{4-x^2}$. **(1)**

11. i) Express $z = \frac{5+\sqrt{2}i}{1-\sqrt{2}i}$ in the form $a + ib$. **(2)**

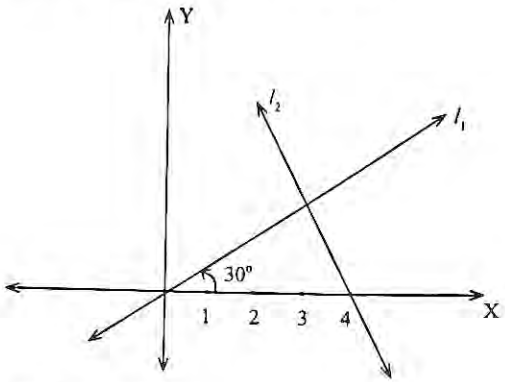
ii) Write the multiplicative inverse of $z = 4 - 3i$ in $a + ib$ form. **(2)**

12. i) Find the number of arrangements of the letters of the word INDEPENDENCE. **(2)**

ii) In how many of these arrangements do all vowels always occur together ? **(2)**

Score

13. In the figure line l_2 is perpendicular to line l_1.



i) Find the slope of l_1. (1)

ii) Find the equation of l_1. (1)

iii) Find the equation of l_2. (2)

14. Find the coordinates of the foci, the vertices, the eccentricity and the length of latus rectum of the ellipse $\frac{x^2}{4}+\frac{y^2}{25}=1$. (4)

15. i) Which of the following point lies in 6th Octant ?

A) (–3, 1, 2)

B) (–3, 1, –2)

C) (–3, –1, –2)

D) (3, –1, –2) (1)

ii) Show that the points (–2, 3, 5), (1, 2, 3) and (7, 0, –1) are collinear. (3)

Score

16. A fair coin is tossed three times consider the following events.

A : No head appears.

B : Exactly one head appears and

C : Atleast two heads appear.

i) Write the sample space and the events A, B and C of the experiment. (2)

ii) Do they form a set of mutually exclusive events ? Give reason. (1)

iii) Find the probability of getting exactly two tails. (1)

Answer any 3 questions from 17 to 20. Each carries 6 scores. **(3×6=18)**

17. i) Prove that $3\sin\frac{\pi}{6}.\sec\frac{\pi}{3}-4\sin\frac{5\pi}{6}.\cot\frac{\pi}{4}=1$. (3)

ii) Prove that $\frac{\cos 4x+\cos 3x+\cos 2x}{\sin 4x+\sin 3x+\sin 2x}=\cot 3x$. (3)

18. i) The 4th term of a Geometric Progression is square of its second term and the first term is –3 determine 7th term. (2)

ii) How many terms of the Geometric Progression $3, \frac{3}{2}, \frac{3}{4}, \ldots$ are needed to give the sum $\frac{3069}{512}$? (4)

19. i) Find the derivative of tan x using first principle. (4)

ii) Find the derivative of $f(x)=\frac{x+\cos x}{\tan x}$. (2)

20. Calculate Arithmetic Mean, Variance and Standard Deviation of the following data.

Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	2	3	8	14	8	3	2

(6)