Class No. : .....

FY 1027

Name : .....

FIRST YEAR HIGHER SECONDARY SECOND TERMINAL EXAMINATION, DECEMBER 2022

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.*
- *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.
- 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. Let $A = \{x : x \text{ is an integer}, 0 \leq x \leq 3\}$ and $B = \{2, 3, 4, 5\}$

a) Write A in roster form. **(1)**

b) Find $A \cup B$ and $A \cap B$. **(2)**

2. a) If $(x + 1, y - 2) = (3, 1)$, find the values of x and y. **(1)**

b) If $A = \{1, 2\}$ and $B = \{5, 6, 7\}$, find $A \times B$ and $B \times A$. **(2)**

3. a) Let $A = \{2, 3\}$, $B = \{1, 2, 4, 5\}$, then the number of relations from A to B is ____ **(1)**

A) 2^6

B) 2^7

C) 2^8

D) 2^9

b) Let $f(x) = x^2$ and $g(x) = x + 2$

i) Find $(f + g)(x)$. **(1)**

ii) Find $(fg)(x)$. **(1)**

4. a) $\sin 420° =$ _____ **(1)**

A) $\frac{1}{2}$

B) $\frac{\sqrt{3}}{2}$

C) $\frac{1}{\sqrt{2}}$

D) 1

b) If $\tan x = \frac{1}{2}$ and x lies in the third quadrant, find $\sin x$ and $\cos x$. **(2)**

Score

5. a) $i^9 + i^{19} =$ _____ (1)

A) i

B) $-i$

C) 0

D) 1

b) Let $z_1 = 3 + 4i$ and $z_2 = 7 + 6i$, find $z_1 + z_2$. (2)

6. The marks obtained by a student of class XI in first and second terminal examination are 62 and 48 respectively. Find the minimum marks he should get in the annual examination to have an average of at least 60 marks. (3)

7. a) ${}^nC_2 = {}^nC_3$, then n = _____ (1)

b) How many chords can be drawn through 21 points on a circle ? (2)

8. Expand $(2x + 3)^5$. (3)

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

9. Let U = {1, 2, 3, 4, 5, 6, 7, 8}, A = {2, 4, 6, 7} and B = {3, 4, 5, 6}

a) Find A′ and B′. (2)

b) Verify that $(A \cup B)' = A' \cap B'$. (2)

10. a) If two sets A and B are disjoint, which among the following is true ? (1)

A) $A \cap B = A$

B) $A \cap B = B$

C) $A \cap B = \phi$

D) $A \cup B = \phi$

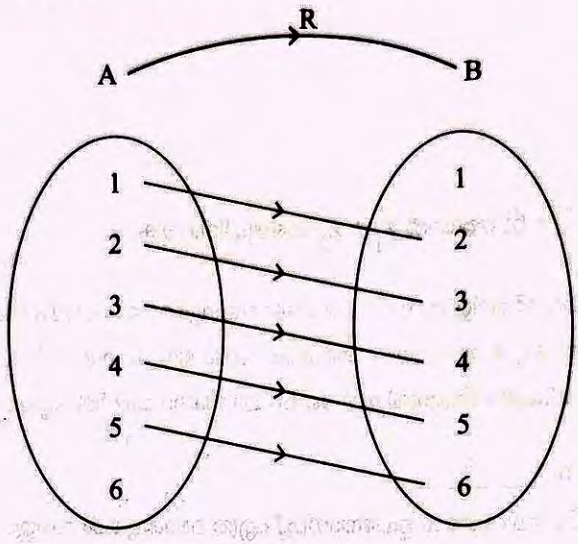
b) Consider the sets A = {1, 2, 3, 4, 5, 6} and B = {3, 4, 5, 6, 7, 8}.

i) Find A – B and B – A. (2)

ii) Find $(A - B) \cup (B - A)$. (1)

Score

11. The following figure represents a relation R on A = {1, 2, 3, 4, 5, 6}.



a) Write relation R in roster form. **(1)**

b) Write relation R in set builder form. **(1)**

c) Find the domain and range of relation R. **(2)**

12. a) $\frac{2\pi}{3}$ radian = _____ degree. **(1)**

b) Prove that $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$. **(3)**

13. Consider the complex number $z = 2(1 + i) + i(1 + i)$.

a) Write z in the form $a + ib$. **(2)**

b) Find z^{-1}. **(2)**

Score

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

b) Draw the graph of the solution on number line. (1)

15. a) If $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$, then find x. (2)

b) In how many ways a committee of 3 persons can be formed from a group of 2 men and 3 women ? (2)

16. a) Number of terms in the expansion of $(x + 3)^{10}$ is _____. (1)

b) Find $(a + b)^4 - (a - b)^4$ and hence evaluate $\left(\sqrt{3} + \sqrt{2}\right)^4 - \left(\sqrt{3} - \sqrt{2}\right)^4$. (3)

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

17. a) Which one of the following is equal to $\{x : x \in R, 1 < x \leq 3\}$? (1)

A) $\{1, 2, 3\}$

B) $\{1, 3\}$

C) $[1, 3]$

D) $(1, 3]$

b) If A and B are two sets such that $A \subset B$, then

i) $A \cap B =$ _____ (1)

ii) Also draw the Venn diagram of $A \cap B$. (2)

c) Write all subsets of $\{1, 2, 3\}$. (2)

18. Consider the function $f(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ 1 & \text{if } x > 0 \end{cases}$

a) Write the domain and range of the function. **(2)**

b) Draw the graph of the function. **(2)**

c) Find $f(2) + f(-2)$. **(2)**

19. a) Find the value of $\sin 75°$. **(2)**

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

c) Show that $\tan x \tan 2x \tan 3x = \tan 3x - \tan 2x - \tan x$. **(2)**

20. a) The number of 3 digit numbers that can be formed from the digits 1, 2, 3, 4, 5, if no digits are repeated is _____. **(1)**

b) Find the number of arrangements of the letters of the word 'MATHEMATICS'. **(2)**

c) In how many of these arrangements do the vowels never come together ? **(3)**
