Reg. No.

FY-27

Name : ..

FIRST YEAR HIGHER SECONDARY EXAMINATION, MARCH 2020

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 × 3 = 18)**

1. (i) If A = $\{x : x$ is a natural number, $x < 5$ and $x > 7\}$, then n(A) is **1**

(A) 1 (B) 0

(C) 2 (D) 3

(ii) The set builder form of (6, 12) is **1**

(A) $\{x : x \in \mathbb{R}, 6 < x \leq 12\}$ (B) $\{x : x \in \mathbb{R}, 6 < x < 12\}$

(C) $\{x : x \in \mathbb{R}, 6 \leq x \leq 12\}$ (D) $\{x : x \in \mathbb{R}, 6 \leq x < 12\}$

(iii) If A and B are two sets such that $A \subset B$, then $A \cup B$ is **1**

(A) A (B) Null set

(C) B (D) $\{\phi\}$

2. In a survey of 600 students in a school, 150 students were found to be taking tea and 225 students were taking coffee. 100 were taking both tea and coffee. Find how many students were taking neither tea nor coffee. **3**

3. Find the principal and general solutions of cosec $x = -2$. **3**

4. (i) If the sum of first 20 terms of an A.P. is equal to the sum of first 30 terms, then the sum of first 50 terms is **1**

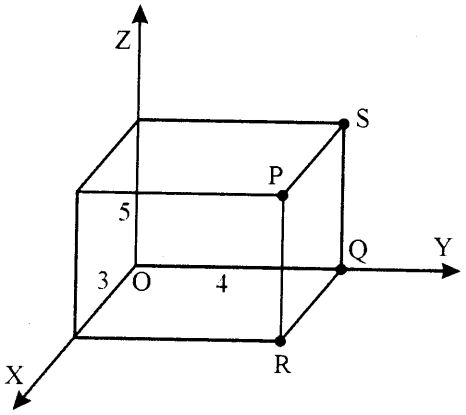
(A) 50 (B) 20

(C) 0 (D) 80

(ii) Find the sum of infinite terms of the G.P. $\frac{-3}{4}, \frac{3}{16}, \frac{-3}{64}, \ldots\ldots$ **2**

5. Find the sum of n terms of the sequence $7 + 77 + 777 + ...$ **3**

6. Consider the following figure.



(i) Find the distance PQ. **1**

(ii) Find the co-ordinates of the point which divides the line segment joining the points P and Q internally in the ratio 2 : 3. **2**

7. Find the derivative of $\cos x$ from first principle. **3**

8. (i) Derivative of $f(x) = 1 + x + x^2 + x^3 + ... + x^{50}$ at $x = 1$ is **1**

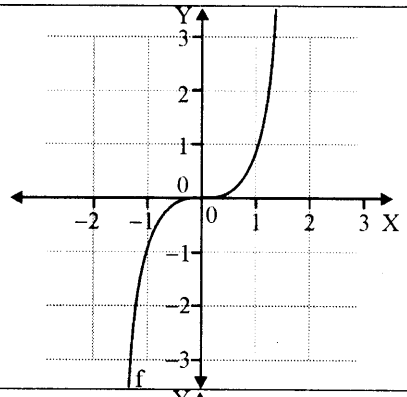
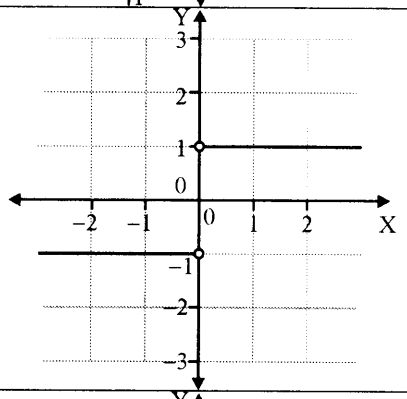
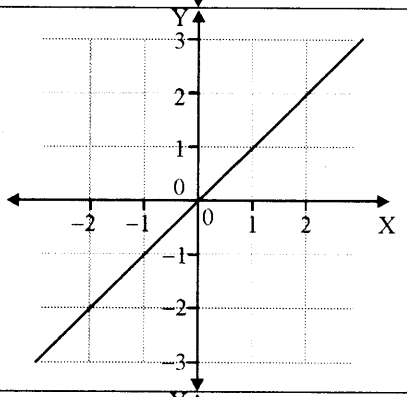
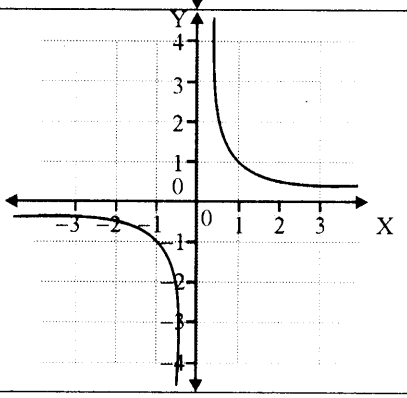
(A) 50 (B) 1250

(C) 1275 (D) $\frac{101}{2}$

(ii) Find $\lim_{x \to 0} f(x)$ if it exists. Where $f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$. **2**

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

9. Match the following :

	(A)		(B)	
(a)		(i)	$f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = \frac{1}{x}, x \neq 0$	1
(b)		(ii)	$f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = x^3, x \in \mathbb{R}$	1
(c)		(iii)	$f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = x, x \in \mathbb{R}$	1
(d)		(iv)	$f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = \begin{cases} 1, \text{if } x > 0 \\ 0, \text{if } x = 0 \\ -1, \text{if } x < 0 \end{cases}$	1
		(v)	$f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = \lvert x \rvert, x \in \mathbb{R}$	

10. For every positive integer n, prove that $7^n - 3^n$ is divisible by 4 using principle of mathematical induction. **4**

11. (i) Modulus of a complex number Z is 2 and $\arg(Z) = \frac{\pi}{3}$. Write the complex number in the form a + ib. **1**

(ii) Find the square root of the above complex number. **3**

12. Solve graphically :

$$2x + y \geq 4$$

$$x + y \leq 3$$

$$2x - 3y \leq 6,$$

$$x \geq 0,$$

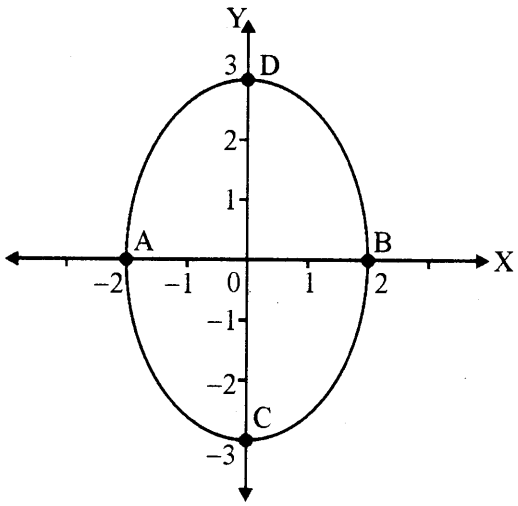
$$y \geq 0$$ **4**

13. (i) Expand $\left(x + \frac{1}{x}\right)^6$ **2**

(ii) Find the middle term in the expansion of $\left(\frac{x}{3} + 9y\right)^{10}$ **2**

14. (i) Let A(1, 2) be a fixed point and 'P' be a variable point in the same plane. P moves in the plane in such a way that its distance from A is always a constant. Suppose 'P' is at the point (3, 5), find the equation of the path traced by 'P'. **2**

(ii) Consider the following ellipse :



(a) Find the equation of the ellipse. **1**

(b) Find the co-ordinates of foci. **1**

15. (i) Write the contra positive of the statement.

"If a number is divisible by 9, then it is divisible by 3." **1**

(ii) By method of contradiction prove that $\sqrt{5}$ is irrational. **3**

16. (i) If E and F are two events such that P(E) = $\frac{1}{4}$, P(F) = $\frac{1}{2}$, P(E and F) = $\frac{1}{8}$, find

(a) P(E or F) **1**

(b) P(not E and not F) **1**

(ii) A committee of two persons is selected from two men and two women. What is the probability that the committee will have

(a) one man ? **1**

(b) two men ? **1**

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

17. (i) If $\tan x = \frac{-5}{12}$, x lies in second quadrant. Find all trigonometric functions. **2**

(ii) Without using triangle, find the value of $\frac{\sin x + \cos x}{\sin x - \cos x}$ if $\tan x = \frac{3}{4}$. **2**

(iii) Prove that $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$. **2**

18. (i) Find the number of different 8 letter arrangement that can be made from the letters of the word 'DAUGHTER' so that all vowels occur together. **2**

(ii) Find the number of ways of choosing 4 cards from a pack of 52 playing cards. **1**

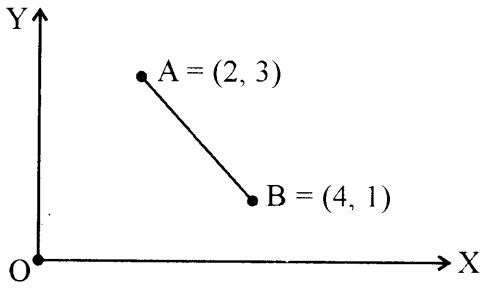
How many of these

(a) Four cards are of the same suits ? **1**

(b) Four cards belongs to different suits ? **1**

(c) Two are red cards and two are black cards ? **1**

19. Consider the following diagram :



(i) Find equation of a line passing through the midpoint of AB and perpendicular to AB. **2**

(ii) Find a point 'C' on X-axis which is equidistant from A and B. **2**

(iii) Find area of Δ ABC. **2**

20. From the following table :

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency	3	7	12	15	8	3	2

Find :

(i) Mean **2**

(ii) Variance **3**

(iii) Coefficient of variation **1**