Nilkantha Secondary School

Nilkantha Municipality-3, Dhading

Second Term Examination, 2079

Class: XI (Science) F.M.: 75

Time: 3 hrs. Subject: C. Mathematics (0071)

Attempt all questions.

Group-A [11×1=11]

Rewrite the correct option in your answer sheet.

1. If $\begin{pmatrix} 0 & x+3 \\ 7 & 0 \end{pmatrix}$ is a Skew-symmetric matrix then x is equal to

   a. -7 b. -5 c. -10 d. 0

2. The quadratic equation $ax^2+bx+c=0$ has real and equal roots if

   a. $b^2<4ac$ b. $b^2-4ac=0$ c. $b^2+4ac<0$ d. $b^2-4ac>0$

3. The value of $\sqrt{-25}.\sqrt{9}$ is

   a. 15 b. -15 c. -15i d. 15i

4. The value of $\lim_{x\to\infty}\frac{2x^2}{3x^2+2}$ is

   a. $\frac{2}{3}$ b. $\frac{3}{2}$ c. $\frac{0}{0}$ d. doesn't exist

5. The value of $\lim_{x\to 0}\frac{e^{3x}-1}{\sin 2x}$ is

   a. 0 b. $\frac{3}{2}$ c. 1 d. $\frac{2}{3}$

6. $\lim_{x\to 1^+} f(x)$ for the function $f(x)=\begin{cases} x^2-2 & \text{for } x>1 \\ x & \text{for } x<1 \end{cases}$ is

   a. -1 b. 1 c. 0 d. None of them

7. The second derivative of the function $f(x)=x^2+1nx$ is

   a. $2-\frac{1}{x^2}$ b. $2x+\frac{1}{x}$ c. $2-\frac{1}{x}$ d. $2+\log x$

8. Which of the following is not critical point of the function $f(x)=x+\frac{1}{x}$

   a. $x=1$ b. $x=-1$ c. $x=0$ d. $x=2$

9. The derivative of $\sec 2x$ at $x = \frac{\pi}{8}$ is

a. $-\sqrt{2}$ b. $-2\sqrt{2}$ c. $2\sqrt{2}$ d. $\sqrt{2}$

10. The value of $\int 5^x dx$ is

a. $\frac{\log 5^x}{5^x} + c$ b. $\frac{5^x}{\log 5^x} + c$ c. $\frac{5^x}{\log 5} + c$ d. None

11. The value of $\int \sec^2 x e^{\tan x+7} dx$ is

a. $e^{\tan x} + c$ b. $e^{\tan x-7} + c$ c. $e^{\tan x+7} + c$ d. $e^{7-\tan x} + c$

Group-B [8×5=40]

12. a. Prove that : $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ if $xyz+1=0$

b. Show that the roots of the equation $x^2 - 4abx + (a^2+2b^2)^2 = 0$ are imaginary.

13. a. If one root of the equation $ax^2+bx+c=0$ be four times the other, show that $4b^2 = 25ac$.

b. Find the value of i^{-47}.

14. a. If $\frac{1-ix}{1+ix} = a - ib$, prove that $a^2+b^2=1$.

b. Find the square roots of $7-24i$.

15. Evaluate:

a. $\lim_{x \to a} \frac{\sqrt{2x}-\sqrt{3x-a}}{\sqrt{x}-\sqrt{a}}$

b. $\lim_{x \to 0} \frac{1-\cos px}{1-\cos qx}$

16. a. Discuss the continuity of function

$$f(x) = \begin{cases} \frac{x^2-7x}{x-7} & \text{for } x \neq 7 \\ 5 & \text{for } x = 7 \end{cases} \text{ at } x = 7$$

b. Evaluate: $\lim_{x \to \infty} e^{-x}$

17. a. Find the derivative of $\frac{1}{2x+3}$ from first principle.

b. Find $\frac{dy}{dx}$ when $y = \cos^{-1} x^3$.

18. a. If $xy = \log(x+y)$, find $\frac{dy}{dx}$.

b. Find the intervals in which the function $f(x) = 3x^2 - 6x + 5$ is increasing or decreasing.

19. Evaluate:

a. $\int \frac{1}{\sqrt{1+2x} - \sqrt{2x-3}} dx$

b. $\int \frac{x^2+5}{x+2} dx$

Group-C [3×8=24]

20. a. If z and w are two complex numbers, prove that $|z-w| \leq |z| + |w|$.

b. Determine the value of p so that each pair of equations may have one root common.

$4x^2 + px - 12 = 0$ and $4x^2 + 3px - 4 = 0$

21. a. A man who has 144ft. of fencing materials wishes to enclose a as can enc rectangular garden, find the maximum area has can enclose.

b. Evaluate: $\lim_{x \to \theta} \frac{x\sin\theta - \theta\sin x}{x - \theta}$

22. Evaluate:

a. $\int \frac{x}{2x^2+5} dx$

b. $\int \cot^4 x \, dx$

-The End-

Symbol No. 25216205

Prasadi Academy (+2) Examination Board
(Under the Management of Prasadi Education Foundation)
Lalitpur.

Class: XI Science 'B4' **F.M: 75**
Subject: Mathematics **P.M.:30**
Exam: Second Term Exam 2079 **Time:3hrs**

Candidates are required to give answers in their own words as far as practicable. Preference will be given to such answer than rote learning. The figures in the margin indicate full marks. Do not scatter your answers.

Attempt all the questions.

Group : A [1 × 11 = 11]

Rewrite the correct option in your answer sheet :

1. The inequality $-3 \le x \le 1$ expressed with absolute value sign is
(a) $|x-1| \le 3$ (b) $|x-1| \le 2$ (c) $|x+1| \le 2$ (d) $|x+1| \le 1$

2. Log (ab) + log (a/b) =
(a) 2 log b (b) 2 log a (c) log a- log b (d) log a + log b

3. The adjoint of a matrix $A = \begin{pmatrix} 2 & -1 \\ 0 & 3 \end{pmatrix}$ is
(a) $\begin{pmatrix} 3 & 0 \\ 1 & 2 \end{pmatrix}$ (b) $\begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$ (c) $\begin{pmatrix} -2 & -1 \\ 0 & 3 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & 1 \\ 0 & -3 \end{pmatrix}$

4. The formula $S_\infty = \frac{a}{1-r}$ holds when
(a) $r > 1$ (b) $r < 1$ (c) $-1 \le r \le 1$ (d) $-1 < r < 1$

5. $\sqrt{-16} \cdot \sqrt{-9}$ =
(a) 12 (b) -12 (c) 12i (d) $-12i$

6. The angle between the two lines represented by $3x^2 - 8xy - 3y^2 = 0$ is :
(a) $\pi/6$ (b) $\pi/3$ (c) $\pi/2$ (d) $2\pi/3$

7. The perpendicular distance between two lines $4x - 3y = 12$ and $4x - 3y = 2$ is
(a) 12/5 (b) 2/5 (c) 2 (d) 1

8. $\frac{d}{dx}(e^{\tan x})$ =
(a) $e^{\tan x}$ (b) $e^{\tan x} \sec^2 x$
(c) $e^{\tan x} \sec x \tan x$ (d) $e^{\tan x} / \sec^2 x$

9. $\lim_{x \to 2} \frac{\sin(x-2)}{x^2-4}$ =

(a) 0/0 (b) 1/2 (c) 1/4 (d) 1

10. The turning points of the curve $f(x) = 1/3\ x^3 - 4x^2 + 15x$, are

(a) 2, 6 (b) 4, 4 (c) – 1, - 7 (d) 3, 5

11. $\int \frac{1}{1-\cos 2x}\, dx$ =

(a) log (1 – cos 2x) + c (b)tan x +c

(c) – cot x + c (d) cosec x. cot x + c

Group : B

12. (a) Construct the truth table for the compound statement : [5 × 8 = 40]

$\sim (p \wedge q)$

(b) If A, B, C are the subsets of a universal set U, prove that [2]

(i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$

13. (a) If one G.M. 'G' and two A.M.s p and q are inserted between two numbers, prove that : $G^2 = (2p - q)(2q - p)$ [3]

(b) If the equation $x^2 + 2(k + 2)x + 9k = 0$ has equal roots, find k. [3]

14. (a) Show that : [2]

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$ [4]

(b) Define symmetric matrix with an example. [1]

15. (a) If $a - ib = \frac{1-ix}{1+ix}$, show that $a^2 + b^2 = 1$. [2]

(b) Determine the square root of 12 - 5i. [3]

16. (a) A function f(x) defined as foliows :

$$f(x) = \begin{cases} x^2 + 2 & for\ x < 5 \\ 20 & for\ x = 5 \\ 3x + 12 & for\ x > 5 \end{cases}$$

Show that f(x) has a removable discontinuity at x = 5. [3]

(b) Evaluate : $\lim_{x \to 0} \frac{1-\cos px}{1-\cos qx}$. [2]

17. (a) Find dy/dx if $x - y = \tan xy$ [3]

(b) Find the derivative of : $\frac{x^2}{1-x^2}$ [2]

18. Find two numbers whose sum is 10 and the sum whose squares is minimum.

19. (a) Evaluate : $\int_0^1 \frac{dx}{1+x^2}$ [5]

(b) Evaluate : $\int e^x \sin x \, dx$ [2]

[3]

Group : C

[8 × 3 = 24]

20. (a) Define one to one and onto function. Show that the function $f(x) = 2x - 3, x \in R$ is one to one onto function. [4]

(b) Let A = { - 1, 0, 2,4 } and a function f: A → R is defined by $f(x) = \frac{x}{x+2}$. Find the range of f. [2]

(c) Let A = [- 3, 1] and B = [- 2, 4]. Perform the operations :

(i) A ∪ B (ii) A – B [2]

21. (a) Evaluate : $\int cotx \, dx$ [2]

(b) If p and p' be the length of the perpendiculars from the origin upon the straight line whose equations are x sec θ + y cosec θ = a and x cos θ – ysin θ = a cos 2θ, prove that $4p^2 + p'^2 = a^2$. [4]

(c) Evaluate : $\lim_{x \to 2} \frac{x^2-4x+4}{x^2-7x+10}$ [2]

22. (a) Find the equation to the pair of lines joining the origin to the intersection of the straight line y = mx + c and the curve $x^2 + y^2 = a^2$. Prove that they are at right angles if $2c^2 = a^2(1 + m^2)$. [4]

(b) Find the derivative by definition of : $\sqrt{\sec x}$ [4]

Class: XI
Subject: Mathematics (0081)

Full Mark: 75
Time: 3 Hours

Candidates are required to give their answers in their own words as far as practicable. The figures in the margins indicate full marks.

Group: A **[1× 11 = 11]**

Rewrite the correct options of each question in your answer sheet.

1. The statement $PV{\sim}p$ is
   a) Contradiction b) tautology c) inverse d) converse
2. The graph of the function $y = ax^2 + bx + c$ *for* $a \neq 0$ is
   a) Pair of lines b) Circle c) Parabola d) Ellipse
3. The nature of the roots of the equation $x^2 + x + 1 = 0$ *is*
   a) rational b) imaginary c) real d) real and equal
4. The value of $Sin\left(tan^{-1}\frac{5}{12}\right)$ is
   a) $\frac{12}{13}$ b) $\frac{5}{13}$ c) $\frac{5}{12}$ d) $\frac{12}{5}$
5. The perpendicular distance between two lines $4x - 3y = 12$ and $4x - 3y = 2$ is
   a) $\frac{12}{5}$ b) $\frac{2}{5}$ c) 2 d) 10
6. The axes of coordinates divides the whole space into
   a) 2 *parts* b) 4 *parts* c) 6 *parts* d) 8 *parts*
7. If $\vec{a} = k\vec{b}$ then $\vec{a}$ and $\vec{b}$ are called
   a) $non - collonear\ vectors$ b) *collinear vectors*
   c) $non - coplanar$ d) *Coplanar vectors*
8. If a coin is tosses three times then the probability of getting at least one head is
   a) $\frac{1}{2}$ b) $\frac{1}{4}$ c) $\frac{3}{8}$ d) $\frac{7}{8}$
9. The one which is not an indeterminate form is
   a) $\frac{0}{0}$ b) $\infty + \infty$ c) $\infty - \infty$ d) $\frac{\infty}{\infty}$

10. The point of inflection of the curve of the function $f(x) = x^2 - 5x + 6$ is

a) $\frac{5}{2}$ b) 0 c) -1 d) *No*

11. The number of subintervals that cannot be taken in Simpson's $\frac{1}{3}$ rule is

a) 3 b) 4 c) 6 d) 8

OR,

The equation of motion with uniformly acceleration is

a) $v = u + at$ b) $s = ut + \frac{1}{2}at^2$

c) $v^2 = u^2 + 2as$ d) *All of the above*

Group: B **[8 × 5 = 40]**

12. a) If p and q be the statements, then prove that $\sim(p \vee q) \wedge q$ is contradiction. (3)

b) Prove that $\log(1 + 2 + 3) = \log 1 + \log 2 + \log 3$ (2)

13. The side of a square is 16cm. A second square is inscribed by joining the mid points of the sides successively. In the second square, we repeat the process, inscribing the third square. If this process is continued indefinitely, what is the sum of the perimeters of all the squares? (5)

14. a) What is the domain of the function $f(x) = \sin^{-1} x$. (1)

b) Show that $\tan^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{27}{11}\right)$ (2)

c) When does a function $f: A \to B$ becomes an onto and one to one. (2)

15. Show that the three vectors $5\vec{a} + 6\vec{b} + 7\vec{c}, 7\vec{a} - 8\vec{b} + 9\vec{c}$ and $3\vec{a} + 20\vec{b} + 5\vec{c}$ are coplanar where $\vec{a}, \vec{b}, \vec{c}$ any three vectors. (5)

16. a) What is the condition for the curve of frequency distribution is symmetrical? (1)

b) A frequency distribution gives C.V. = 5%, S.D. = 2 and $S_k(p) = 0.5$ then find mean and mode. (2)

c) If A and B are two independent events with $P(A) = \frac{2}{3}$ and $P(B) = \frac{3}{5}$ find $P(A \cup B)$. (2)

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17. a) Let $f(x) = \begin{cases} x^2+5 & for\ x<5 \\ 25 & for\ x=5 \\ 3x+15 & for\ x>5 \end{cases}$

i. Find $\lim_{x\to 5} f(x)$ (1)

ii. Find $f(5)$. (1)

iii. is $f(x)$ continuous at $x = 5$. (1)

b) Evaluate $\lim_{x\to\infty}(\sqrt{x}-\sqrt{x-3})$ (2)

18. Find the area of a circle $x^2 + y^2 = 121$ using integration method. (5)

19. Evaluate using composite trapezoidal rule the integral $\int_0^1 \frac{dx}{1+x}, n = 5$. Also find the error of approximation from its actual value. (4+1)

OR,

Two forces P *and* Q act at a point. Their resultant R is at right angles to P. Show that $Q^2 - P^2 = R^2$ where the angle between the forces is equal to $\cos^{-1}\left(-\frac{P}{Q}\right)$. (5)

Group: C $[3 \times 8 = 24]$

20. a) If one root of the equation $x^2 - px + q = 0$ twice the other show that $2p^2 = 9q$. (2)

c) i) Define complex number. Why the complex numbers are introduced? explain with one example. (2)

ii) Find the square root of $3 - 4i$. (2)

c) Prove that $\begin{bmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{bmatrix} = (x-y)(y-z)(z-x)$ (2)

21. a) The length of the perpendicular drawn from the point (a,3) on the line $3x + 4y + 5 = 0$ is 4, find the value of a. (3)

b) Find the separate equations of the line. $x^2 - 5xy + 4y^2 = 0$. (2)

c) Find the point where the line though the points (1,2,3) and $(4,-4,9)$ meet the yz plane. (3)

22. i) Write $\frac{dy}{dx}$ in terms of $\frac{dy}{dt}$ and $\frac{dt}{dx}$. (1)

ii) Find the $\frac{dy}{dx}$ if $y = \frac{t-1}{2t}$ *and* $t = \sqrt{x+1}$. (2)

iii) Write the necessary condition for the curve $y = f(x)$ to have maxima or minima. (2)

iv) Calculate the maximum and minimum values of $f(x) = 2x^3 - 3x^2 - 36x$. (3)

"The End"

V.S. NIKETAN SECONDARY SCHOOL

[Under the management of V.S. Education Foundation]
Tinkune, Kathmandu, Nepal

FIRST TERM EXAMINATION - 2081

Grade: - Science – XI FM.:75
Subject: Basic Maths Time: - 3 hours PM. :30

(Rewrite the correct option in your own answer sheet.)

Group: "A" [11× 1 = 11]

1. Which of the following is a statement?
   a) The fishes are beautiful. b) Study mathematics.
   c) X is a capital of a country. d) Water is essential for health.
2. The number of proper subsets of set A = {a, b, c, d} is
   a) 16 b) 15 c) 8 d) 12
3. The inequality $2 \leq x \leq 4$ is same as
   a) $|x-2| \leq 1$ b) $|x-3| \leq 1$ c) $|x-2| < 1$ d) $|x-3| \geq 1$
4. The point of intersection of the perpendicular bisector of the side of a triangle is called .....
   a) Circumcenter b) Orthocenter c) Centroid d) In-center
5. The equation of straight line passing through the point (-5, -6) and (3, 10) is .....
   a) 2x+y=4 b) 2x-y+4=0 c) x-2y=4 d) None of these
6. Which points are on the same sides of the line x-y+2=0?
   a) (3,2), (-3,1) b) (-3,1), (3,-1) c) (3,2), (3,-1) d) (0,0), (-2,1)
7. The equation $x^2+ky^2+4xy=0$ represents two coincident lines, if k is .....
   a) 0 b) 1 c) 4 d) 16
8. In the relation $\lim_{x\to 0}\frac{\sin x}{x} = 1$, x is measured in:
   a) degree b) radian c) grade d) all of above
9. For what value of k, the following function is continuous at x=π,
   $$F(x) = \begin{cases} kx+1, if\ x \leq \pi \\ \cos x, if\ x > \pi \end{cases}$$
   a) 1 b) π c) $\frac{2}{\pi}$ d) $-\frac{2}{\pi}$
10. If $\lim_{x\to 3}\frac{x^n-3^n}{x-3} = 108$, then value of n=?
    a) 3 b) 5 c) 4 d) 6
11. $\lim_{x\to\infty}\frac{(3x+2)^6(2x-5)^4}{(2x+5)^{10}}$ is equal to

a) ∞ b) $\frac{8}{8}$ c) $\frac{164}{24}$ d) $\frac{729}{64}$

Group: "B" [8× 5 = 40]

12. a) Define the term tautology and contradiction in logic. Obtain the truth value of the compound statement $\sim p \wedge (p \vee q) \Rightarrow q$. [3]
    b) Prove conditional statement and its contra positive are logically equivalent using the truth table. [2]
13. a) If A and B are the subsets of the universal set U, prove that: $(A \cap B)' = A' \cup B'$ [2]
    b) Define difference and symmetric difference of two sets. If A, B, C are subset of universal set U, then prove that: $A - (B \cup C) = (A - B) \cap (A - C)$. [3]
14. a) Rewrite the following relation using absolute value sign.: $\frac{5}{3} \leq x \leq 3$ [2]
    b) Define absolute value of real number and solve.: $|2x + 1| \geq 3$ and draw the graph. [3]
15. a) Give two straight lines, 3x-4y+3=0 and 12x-5y-1=0,
        i) Are the lines intersecting? [1]
        ii) Find the equations of the bisector of the angle between the straight lines. [2]
        iii) Show that the bisectors subtended each other at right angle. [1]
        iv) Identify the bisector of the acute angle. [1]
16. a) What are the three standard forms of equation of a straight line? Let P denote the length of perpendicular drawn from origin: (0, 0) upon a line $\frac{x}{a} + \frac{y}{b} = 1$ then prove that $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2}$. [3]
    b) Find the angle between the straight lines represented by the equation: $x^2+6xy+9y^2+4x+12y-5=0$. [2]
17. Define continuity and discontinuity of a function. A function f(x) is defined as follows:

$$f(x) = \begin{cases} 3 + 2x \; for -\frac{3}{2} \leq x < 0 \\ 3 - 2x \; for \; 0 \leq x < \frac{3}{2} \\ -3 - 2x \; for \; x \geq \frac{3}{2} \end{cases}$$

Show that f(x) is continuous at x=0 and discontinuous at $x=\frac{3}{2}$ [1+4]

18. Evaluate:

a) $\lim_{y \to x} \frac{\sec y - \sec x}{y - x}$ [2]

b) $\lim_{x \to \frac{\pi}{4}} \frac{1 - \tan x}{\frac{\pi}{4} - x}$ [3]

19. a) Consider a function $f(x) = \frac{x^2 - 25}{x - 5}$. Discuss the type of discontinuity at x = 5. Is it possible to make f(x) continuous at the specified point? Why? [1+2]

b) A function $f(x) = \begin{cases} x^2 - 1 \text{ for } x < 3 \\ 2kx \text{ for } x \geq 3 \end{cases}$ find the value of k so that f(x) is continuous at x = 3. [2]

Group: "C" [3× 8 = 24]

20. a) If $U = (-\infty, \infty) = R$, then A=[-2, 4) and B=(2, 5], compute $A \cup B, A \cap B, A - B, B - A, and\ A'$. [5]

b) Solve: $x^2 - 2x - 3 > 0$ [3]

21. a) If a given that P_1 and P_2 are the length of the perpendicular drawn from the points of $(\text{Cos } \theta, Sin\ \theta)$ and $(-\sec\theta, cosec\ \theta)$ on the line $x sec\ \theta + y cosec\ \theta = 0$, respectively, prove that: $\frac{4}{p_1^2} - p_2^2 = 4$ [5]

b) Find the equation of the two straight lines represented by the equation $2x^2 + 3xy + y^2 + 5x + 2y - 3 = 0$. [3]

22. a) Evaluate: $\lim_{x \to \infty} (\sqrt{x} - \sqrt{x-4})$ [2]

b) Define limit of a function and evaluate: $\lim_{x \to \theta} \frac{x\ cosec\ \theta - \theta\ cosec\ x}{x - \theta}$ [4]

c) Evaluate: $\lim_{x \to a} \frac{\sqrt{x+a} - \sqrt{3x-a}}{x - a}$ [2]

THE END

Subject Code : 0071

Grade: XI
2081 (2024)
Mathematics

Time: 3 hrs. **Full Marks : 75**

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

Group 'A' **[11 × 1 = 11]**

Rewrite the correct option in your answer sheet.

1. Which of the following is a statement.
   i. Mathematics is a beautiful language.
   ii. Limit value of any function f(x) exists when left hand limit and right hand limit of function are equal.
   iii. What is derivative?
   iv. Algebra, Trigonometry, Analytic Geometry, Vectors, Statistics and probability, calculus, computational methods or mechanics.

2. Domain of $f(x) = \sqrt{3-x} + \sqrt{x+1}$ is,
   i. $x \leq 3$ ii. $x \geq -1$
   iii. $-1 \leq x \leq 3$ iv. $x \leq -1, x \geq 3$

3. $\tan^{-1}\sqrt{3} + \tan^{-1}\sqrt{3} =$
   i. $\frac{-\pi}{3}$ ii. $\frac{\pi}{3}$ iii. $\frac{4\pi}{3}$ iv. $\frac{2\pi}{3}$

4. The distance between the parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$ is:
   i. 2/5 ii. 3/7 iii. 7/5 iv. 3/5

5. Three vectors $\vec{i} + 2\vec{j} + 3\vec{k}$ and $2\vec{i} + 3\vec{j} + 4\vec{k}$ and $3\vec{i} + 4\vec{j} + 6\vec{k}$ are,
   i. Linearly independent ii. Coplanar
   iii. Linearly dependent iv. Collinear

6. If A and B are two independent events then $P(A \cap B) =$

i. $P(A) + P(B)$ ii. $\frac{P(A)}{P(B)}$ iii. $P(A) \cdot P(B)$ iv. $\frac{P(B)}{P(A)}$

7. $\lim_{x \to 0} \frac{\sin x}{x} =$

i. $\frac{0}{0}$ ii. 0 iii. 1 iv. does not exist

8. If $y = \tan\left(\frac{2x}{3}\right)$, then $\frac{dy}{dx}$ at $x = 0$ is

i. $\sec^2\left(\frac{2x}{3}\right)$ ii. $\frac{2}{3}\sec^2\left(\frac{2x}{3}\right)$

iii. 0 iv. $\frac{2}{3}$

9. The sum of two numbers is 8. Then the two numbers whose sum of the squares is minimum are

i. 1, 7 ii. 2, 6 iii. 4, 4 iv. 3, 5

10. The area bounded by the curve $y = 4x$, x - axis and $x = 1, x = 2$

i. $2x^2$ ii. 6 iii. 2 iv. 4

11. The number of negative root of the equation $x^3 + x - 4 = 0$ is

i. 1 ii. 3 iii. 0 iv. 4

OR

A car moving distance $x = 10 + 4t + t^3$ in time t, then the acceleration at the end of $t = 4$ sec is ,

i. $12 m/s^2$ ii $16 m/s^2$ iii. $24 m/s^2$ iv. $24 m/s^2$

Group 'B' [8 × 5 = 40]

12. Given a quadratic equation $ax^2 + bx + c = 0$, answer the following questions:

a) What is the condition for 'a' ? [1]

b) What are the two roots of the given quadratic equation? [1]

c) Write the relation between coefficients a, b, c and roots of given equation. [1]

d) Under what condition will this quadratic equation has imaginary roots. [1]

e) Write the condition having one root reciprocal of the other root. [1]

13. Give A = [-3, 1] and B = [-2, 4] find A – B drawing graph.

b) If A be the A.M and H the H.M between two quantities 'a' and 'b', show that, [2]

$$\frac{a-A}{a-H}\cdot\frac{b-A}{b-H}=\frac{A}{H}$$

c) Find the cofactor matrix of the matrix, [2]

$$A=\begin{pmatrix}1 & -1 & 1\\ 2 & 1 & -3\\ 1 & 1 & 1\end{pmatrix}$$

14. a) If $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\pi$, show that $x+y+z=xyz$. [3]

b) Solve $secx.tanx=\sqrt{2}$ [2]

15. a) Show that the following vectors are coplanar: [3]

$\vec{p}=\vec{a}+2\vec{b}+3\vec{c}$, $\vec{q}=-2\vec{a}+3\vec{b}-3\vec{c}$, $\vec{r}=-\vec{b}+2\vec{c}$

b) If $3\vec{i}+\vec{j}-\vec{k}$ and $\lambda\vec{i}-4\vec{j}-4\vec{k}$ collinear vectors, find the value of λ [2]

16.a) Calculate the skewness based on mean, mode and standard deviation for the given informations: [3]

$$\Sigma fx=110,\quad \Sigma fx^2=1650,$$
$$N=10, \text{and } m_0=12.45.$$

b) The chance that A can solve a certain problem is $\frac{1}{4}$. The chance that B can solve it is $\frac{2}{3}$. Find the chance that the problem will be solved if they both try. [2]

17. a) Evaluate $\lim_{x\to 0}\frac{1-cosx}{x^2}$ [2]

b) A function f(x) is defined as follows: [3]

$$f(x)=\begin{cases}x^2+2 & for \quad x<5\\ 20 & for \quad x=5\\ 3x+12 & for \quad x>5\end{cases}$$

Show the f(x) has removable discontinuity at x=5. Hence re-define it to make continuous.

18. a) Find, from definition the derivative of $\frac{1}{\sqrt{5x-2}}$ [3]

b) Evaluate $\int_{-1}^{0} \frac{1}{x+2} dx$ [2]

19. a) Using simpson's $\frac{1}{3}$ *rule*, evaluate $\int_{1}^{5} x^4 dx$ with 4 sub-intervals. [2]

b) Using Newton's iteration method find the square root of 3 correct to 3 places of decimals. [2]

c) Why we can't use bisection method to the function $f(x)=x^2$ though the equation $x^2=0$ has a root x=0. [1]

OR

a) PQRSTU is a regular hexagon forces of magnitude 2, $4\sqrt{3}, 8, 2\sqrt{3}$, and 4 newtons act at P in the directions PQ, PR, PS, PT and PU respectively. Find the magnitude and direction of their resultant. [3]

b) A particles slides down a smooth plane inclined at angle of 30^0 to the horizon. Find its velocity when it reaches the ground if the length of the plane is40m ($g=10ms^{-2}$). [2]

Group 'C' [3 × 8 = 24]

20. a) A function $f(x) = x^2 - 1$ is given.

i. Find the domain of f(x). [1]

ii. Find the range of f(x). [1]

iii. Check for odd or even nature or symmetry of f(x). [1]

iv. Write the vertex and minimum value of the f(x). [1]

v. Sketch the graph of it using above characteristics. [1]

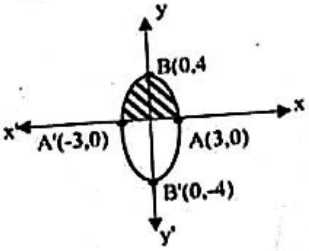
b) If z= 3 - 4i then:

i. Represent z and $\bar{z}$ in graph. [1]

ii. Find $\sqrt{z}$. (2]

21 a) Find the maximum area of a rectangular plot of land which can be enclosed by a rope of length 60 meters. [4]

b) The figure alongside cuts the axes of x and y at A(3, 0) and A'(-3, 0), B(0, 4), B'(0, -4) respectively. It is symmetrical about both axes. find the area of the shaded region showing all necessary working by using integration. [4]



22. a) If the direction cosine of a line are proportional to 1,-3,2 then find the direction cosines of the line. [2]

b) The equations of the two straight lines are $3x-y=5$ and $6x+2y+15=0$ find the equation of bisector of the angle that contains origin. [2]

c) Prove that $2x^2+7xy+3y^2-4x-7y+2=0$ represents two straight lines. [2]

d) If the pair of lines $x^2-2pxy-y^2=0$ and $x^2-2qxy-y^2=0$ be such that each pair bisects the angle between the other pair, prove that $pq=-1$ [2]

THE END

HISSAN EXAMINATION BOARD-2079

Sub. Code: 0071

Gandaki Province

Time: 3 hrs. | COM. MATHEMATICS | Full Marks: 75

GRADE-XI

Candidates are required to give their answers in their own words as far as practicable.

Attempt ALL Questions.

Set A

Group A

Rewrite the correct option in your answer sheet. **[11x1=11]**

1. A Δ B is equal to
   a) (A−B)∩(B−A) b) (A−B) ∪ (B−A)
   c) A ∩ (B−A) d) B ∪ (B−A)

2. $i^{15} \times i^{13}$ is equal to
   a) -1 b) 1 c) i d) $-i$

3. In any ΔABC, a=3, b=5 and c=6. What is the value of $\cos\frac{A}{2}$?
   a) $\frac{1}{\sqrt{15}}$ b) $\sqrt{\frac{14}{15}}$ c) $\frac{1}{\sqrt{14}}$ d) $2\sqrt{14}$

4. If $|\vec{a}+\vec{b}| = |\vec{a}-\vec{b}|$ then
   a) $\vec{a} // \vec{b}$ b) $\vec{a} \perp \vec{b}$ c) $\vec{a} = \vec{b}$ d) $\vec{a} = k\vec{b}$

5. What is the focus of the parabola whose equation is $x^2=-4ay$?
   a) (a, o) b) (−a, o) c) (o, a) d) (o, −a)

6. A bag contains 8 red and 5 white balls. Three balls are drawn at random. Find the probability that all three balls are of same colour.
   a) $\frac{2}{13}$ b) $\frac{28}{143}$ c) $\frac{40}{143}$ d) $\frac{5}{143}$

7. Which of the following is incorrect?
   a) $\lim_{x\to 0}\frac{a^x-1}{x} = \log a$ b) $\lim_{x\to a}\frac{x^n-a^n}{x-a} = na^{n-1}$
   c) $\lim_{x\to 0}\frac{e^x-1}{x} = 1$ d) $\lim_{x\to 0}\frac{a^x-b^x}{x} = \log\frac{b}{a}$

8. In which of the following intervals is the function $f(x)= x^3+ x^2-x-1$ decreasing?

a) $(-\infty, -1)$ b) $(\frac{1}{3}, \infty)$ c) $(-1, \frac{1}{3})$ d) $(-\infty, \frac{1}{3})$

9. $\int x\,Cosx\,dx$ gives

a) $x\,Sinx + Cosx + C$ b) $Cos\,x + Sinx + c$

c) $x\,Cosx + Sinx + C$ d) $Cos\,x - xSinx + c$

10. Which of the following is not the characteristics of numerical computing?

a) Accuracy b) Efficiency c) Stability d) Truncatating

11. A bus is moving at a speed of 60 km/hr. If it decelerates 2km/hr², what will be the final velocity in 6 hours?

a) 48 km/hr b) 72 km/ hr c) 0 km/ hr d) 58 km/hr

OR

What is the equilibrium price when the demand function is Q_D=500-5p and supply function is Qs=110+8p?

a) 20 b) 30 c) 350 d) 450

Group B [8x5=40]

12. a) If $-6 \le 3x + 3 \le 12$, prove that $-3 \le x \le 3$. (2)

b) Define bijective function. Determine if the given function $f(x) = x^3 + 2x$ is even, odd or neither even nor odd. (3)

13. a) Prove $(G.M)^2$ =(A.M)× (H.M) for any two unequal positive numbers. (2)

b) Find the sum to infinity of $1 + 2^2a + 3^2a^2 + 4^2a^3 + \ldots\ldots$ when $|a| < 1$. (3)

14. a) If R be the circum-radius of ΔABC then prove that $\Delta = \frac{abc}{4R}$ (2)

b) Find vectorically the angle between two diagonals of a cube. (3)

15. Define Bowley's Coefficient of Skewness. Calculate Karl Pearson's Coefficient of Skewness from the following data:

Class	300-400	400-500	500-600	600-700	700-800
f	5	10	10	3	2

16. a) Find $\frac{dy}{dx}$ if $x^2 + 2xy + y^3 = 42$. (2)

b) Find the area bounded by the parabola $y^2 = 4ax$ and its latus rectum. (3)

17. Evaluate: $\int \frac{x^2 dx}{\sqrt{a^2 - x^2}}$

18. Use the bisection method to find the solution of $x^3 - x - 1 = 0$ in the interval (1,2) correct to three places of decimals.

19. A particle falls freely from the top of the tower and during the last 2 seconds, it falls through $\frac{3}{4}$ th of the height of the tower. Find the height of the tower.

OR

A firm has a demand function $P = 108 - 5Q$ and cost function $C = -12Q + Q^2$. Find the marginal cost, marginal revenue, maximum profit and the price at which the profit is maximum.

Group C [3x8=24]

20. a) Prove that

$$\begin{vmatrix} a+b+c & -c & -b \\ -c & a+b+c & -a \\ -b & -a & a+b+c \end{vmatrix} = 2(a+b)(b+c)(c+a)$$

(4)

b) For any complex number Z, prove that $\frac{1}{2}(z+\bar{z})$ = Real z. (2)

c) Show that $(p \wedge q) \wedge \sim(p \vee q)$ is a contradiction. (2)

21. a) Find the equation of the bisector of obtuse angle formed by the lines $12x - 5y + 7 = 0$ and $4x - 3y + 1 = 0$. (3)

b) Show that the equation $3x^2 + 7xy + 2y^2 + 5x + 5y + 2 = 0$ represents a pair of straight lines. (3)

c) Find the equation of tangent to the circle $x^2 + y^2 - 2x - 10y + 1 = 0$ at $(-3, 2)$ (2)

22. a) Evaluate: $\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$ (2)

b) For what value of K is the following function continuous at x=1?

$$f(x) = \begin{cases} \frac{x^2-1}{x-1} & , x \neq 1 \\ k & , x = 1 \end{cases}$$ (2)

c) Find from the first principle the derivatives of $\sec x$. (4)

The End