



ST. XAVIER'S COLLEGE

Maitighar, Kathmandu

Online Pre-Annual Examination- 2022

Grade: XI

Subject: Mathematics (0071)

Time: 3 Hours

Full Marks: 75

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

Attempt all questions.

Group A [11 x 1 = 11]

Rewrite the correct option in your answer sheet.

- The negation of some students intelligent.
(a) No students is intelligent. (b) All students is intelligent.
(c) Some students is intelligent. (d) Not all students is intelligent.
- The number of functions form $\{3,4,5\}$ into $\{a,b\}$ is
(a) 8 (b) 6 (c) 4 (d) 2
- The period of the function $f(x) = \sin^6 x + \cos^6 x$ is
(a) π (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) 2π
- If a, b, c, d are in H.P, then $ab+bc+ad$ equals
(a) ad (b) $2ad$ (c) $3ad$ (d) $4ad$
- In triangle ABC, $a(b \cos C - c \cos B)$ is equal to
(a) 0 (b) a^2 (c) $a^2 + b^2$ (d) $b^2 - c^2$
- If the vertex of parabola $y = x^2 - 16x + k$ lies on X-axis, then value of k is
(a) 8 (b) 16 (c) 64 (d) -64
- The probability of a problem being solved by two students are $\frac{1}{2}$ and $\frac{1}{3}$. The probability of the problem being solved is
(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{4}{3}$ (d) 1

8. Let $f(x) = x$; if x is rational

$1 - x$; if x is irrational then

- (a) f is only right continuous at $x = \frac{1}{2}$ (b) f is only left continuous at $x = \frac{1}{2}$
(c) f is continuous at $x = \frac{1}{2}$ (d) f is discontinuous at all points

9. The area of the region bounded by $y^2 = 4ax$ and $x^2 = 4by$ is

- (a) $\frac{ab}{3}$ (b) $\frac{4ab}{3}$ (c) $\frac{16ab}{3}$ (d) $\frac{16a}{3}$

10. If $f(x) = x^2 - 2$ and $x_0 = 1$ then the value of x_2 using Newton – Raphson's method is given by

- (a) 1.41 (b) 1.82 (c) 1.31 (d) 1.041

11. A ball is projected vertically upwards with a velocity 39.2 m/s. Then the time of flight is given by
($g = 9.8 \text{ m/s}^2$)

- (a) 4 sec (b) 5 sec (c) 6 sec (d) 8 sec

Group B [5 x 8 = 40]

12. Define domain, co-domain and range of the function.

Also, find the domain and range of the functions $f(x) = -x^2 + 4x - 3$ [2+3]

13.(a) Find the square roots of the complex number $z = -1 - 2i$ [2+3]

(b) If $\cos A = \frac{4}{5}$ and $\cos B = \frac{3}{5}$, find the ratio of side of the triangle.

14. In any triangle ABC, if a^2, b^2, c^2 are in AP, prove that $\cot A, \cot B, \cot C$ are in AP. [5]

15.(a) what do you understand by skewness ? How is it measured? [1+4]

(b) The following facts were gathered from two manufacturing firms.

	Firm – A	Firm –B
Mean wage	Rs. 175	Rs.180
Median wage	Rs. 172	Rs. 170
Standard deviation	Rs. 13	Rs. 19

Compare the two distributions on the basis of skewness.

16. Find $\frac{dy}{dx}$ if, [3+2]

(a) $x^7 \cdot y^3 = (x+y)^{10}$

(b) $e^{xy} = \log(x^2 + y^2)$

17. Integrate:

[2+3]

(a) $\int \sec x dx$

(b) $\int_0^{\frac{\pi}{2}} x \sin x dx$

18. Solve the equation $x^2 - 9x + 1 = 0$ for the root lying between 0 and 3, correct to 3 places of decimals. [By Bisection method] [5]

19. ABCDEF is a regular hexagon. Forces of magnitudes 2, $4\sqrt{3}$, 8, $2\sqrt{3}$ and 4 N act at point in the directions AB, AC, AD, AE and AF respectively. Find the magnitude and direction of the resultant. [5]

Group - C [3 x 38 = 114]

20.(a) Find the condition that one of the lines given by $ax^2 + 2hxy + by^2 = 0$ may be perpendicular to one of the lines given by $a'x^2 + 2h'xy + b'y^2 = 0$.

(b) If the line $lx + my = 1$ touches the circle $x^2 + y^2 = a^2$, prove that the point (l, m) lies on the circle of radius $1/a$. [4+4]

21. (a) What do you understand by indeterminate form?

Also, Evaluate : $\lim_{x \rightarrow \theta} \frac{x \cot \theta - \theta \cot x}{x - \theta}$

(b) Find the area of an ellipse, $4x^2 + y^2 = 36$ (Using integration) [4+4]

22. (a) Show that:

$$\begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{vmatrix} = (b^2 - ac) (ax^2 + 2bxy + by^2)$$

(b) Use vector method to prove, $\cos(A+B) = \cos A \cos B - \sin A \sin B$ [4+4]
