



MATHEMATICS HSSC-II

SECTION - A (Marks 20)

Time allowed: 25 Minutes

Version Number 4 1 1 1

Note: Section - A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) What results in evaluating $\lim_{x \rightarrow 0} x \cdot \sin\left(\frac{1}{x}\right)$

- A. Undefined B. 1 C. 0 D. -1

2) Which of the following is an even function?

A. $f(x) = \cos x - \frac{x}{2}$

B. $f(x) = \frac{1 - \cos x}{\sin^2 x}$

C. $f(x) = \frac{x^2 - 16}{x - 4}$

D. $f(x) = (x - 5)^2$

3) Choose domain of the function represented by $f(x) = \sqrt{1-x} \ln x$

- A. $(-\infty, 0]$ B. $[0, 1)$ C. $(0, +\infty)$ D. $(0, 1]$

4) What is the derivative of $\cos^2 x$ at $x = \frac{\pi}{4}$

- A. -1 B. 1 C. $\frac{2}{\sqrt{2}}$ D. $\frac{1}{2}$

5) What is the derivative of $\ln(e^x)$?

- A. -1 B. 0 C. $\frac{1}{2}$ D. 1

6) In which of the following intervals $f(x) = x^2$ decreases?

- A. $(-\infty, +\infty)$ B. $(0, 0)$ C. $(-\infty, 0)$ D. $(0, +\infty)$

7) For what value of k $\int_0^1 (4+k) dx = 4$?

- A. -1 B. 1 C. 0 D. 2

8) What represents $\int e^x \left(\ln x + \frac{1}{x} \right) dx$ in the following?

- A. $e^{-x} \cdot \ln x + c$ B. $e^x \cdot \ln x + c$ C. $e^{-x} \cdot \frac{1}{x} + c$ D. $e^x \cdot \frac{1}{x} + c$

- 9) What is the evaluated value of $\int_0^1 \frac{1}{x-1} dx$.
- A. 10 B. 0 C. 1 D. Undefined
- 10) What is the solution of a differential equation $\frac{dy}{dx} = \sin x$
- A. $y = -\cos x + c$ B. $dy = -\sin x + c$ C. $dy = -\cos x + c$ D. $y = \cos x + c$
- 11) For what value of p , $y = 4x + 3$ is parallel to $y = \frac{1}{3}p + 3$
- A. -12 B. $-\frac{3}{4}$ C. 0 D. 12
- 12) Which of the following lines, passes through $(-2, 1)$?
- A. $5x + 8y + 2 = 0$ B. $-5x + 8y - 2 = 0$
 C. $5x + 8y + 2 = 10$ D. $5x - 8y - 2 = 10$
- 13) What is the perpendicular distance of $(3, -5)$ from x-axis?
- A. -4 B. 5 C. 3 D. -3
- 14) For which of the following inequalities $(0, 0)$ is **NOT** a solution?
- A. $-2x + y < -1$ B. $x + y + 1 > 0$ C. $2x + y < 1$ D. $x - y < 1$
- 15) What is the length of the tangent drawn from $(-1, 2)$ to the circle $x^2 + y^2 + 4x + 2y = 0$?
- A. $\sqrt{13}$ B. 5 C. $\sqrt{5}$ D. 0
- 16) What is the eccentricity of a circle $x^2 + y^2 = 2$?
- A. 0 B. $\sqrt{2}$ C. 2 D. 1
- 17) What are the equations of the asymptotes of a hyperbola $\frac{y^2}{4^2} - \frac{x^2}{7^2} = 1$?
- A. $y = \pm \frac{7}{4}x$ B. $y = \pm \frac{4}{7}x$ C. $x = \pm \frac{14}{8}y$ D. $x = \pm \frac{8}{14}y$
- 18) Which of the following is a unit vector in the direction of $3\mathbf{i} - 4\mathbf{j}$
- A. $\frac{3}{5}\mathbf{i} + \frac{4}{5}\mathbf{j}$ B. $\frac{3}{5}\mathbf{i} - \frac{4}{5}\mathbf{j}$ C. $3\mathbf{i} + 4\mathbf{j}$ D. $\frac{3}{\sqrt{5}}\mathbf{i} - \frac{4}{\sqrt{5}}\mathbf{j}$
- 19) For what value of m , vectors $4\mathbf{i} + 3\mathbf{j} - 3\mathbf{k}$ and $m\mathbf{i} + 3\mathbf{k}$ have the same magnitude?
- A. 25 B. 15 C. -25 D. ± 5
- 20) What is the result of $\mathbf{a} \times (\mathbf{b} \cdot \mathbf{c})$ if $\mathbf{a} = \mathbf{i} + 2\mathbf{j} + \mathbf{k}$, $\mathbf{b} = \mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ and $\mathbf{c} = \mathbf{i} - 7\mathbf{j} - 4\mathbf{k}$?
- A. 20 B. 48
 C. It is Meaningless D. 38



MATHEMATICS HSSC-II

Time allowed: 2:35 Hours

Total Marks Sections B and C: 80

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly. Graph paper will be provided on Demand.

SECTION - B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks.

(10 x 4 = 40)

- (i) Find $f \circ g(x)$ and $g \circ f(x)$ for the real valued functions $f(x) = 3x^4 - 2x^3$; $g(x) = \frac{2}{\sqrt{x}}$, $x \neq 0$
- (ii) Evaluate $\lim_{x \rightarrow \infty} \left(\frac{x}{1+x} \right)^x$
- (iii) Differentiate $\sin^3 x$ w.r.t. $\cos^2 x$
- (iv) If $\tan y(1 + \tan x) = 1 - \tan x$, then show that $\frac{dy}{dx} = -1$
- (v) If $y = e^{-ax}$, then show that $\frac{d^3 y}{dx^3} + a^3 y = 0$
- (vi) Evaluate $\int \frac{dx}{(1+x^2)^{3/2}}$
- (vii) Find the general solution of the differential equation $\frac{dy}{dx} - x = xy^2$. Also find a particular solution if $y = 1$ when $x = 0$
- (viii) Evaluate $\int_0^{\pi/4} \sec x (\sec x + \tan x) dx$
- (ix) Find 'h' such that the points $A(\sqrt{3}, -1)$, $B(0, 2)$ and $C(h, -2)$ are the vertices of a right triangle with right angle at the vertex A.
- (x) Find equations of the lines represented by $x^2 + 2xy \sec \alpha + y^2 = 0$. Also find measure of the angle between them.
- (xi) Show that the circles $x^2 + y^2 + 2x - 8 = 0$ and $x^2 + y^2 - 6x + 6y - 46 = 0$ touch internally.
- (xii) A parabolic arch has a 100 m base and height 25 m. Find the height of the arch at the point 30 m from the centre of the base.
- (xiii) Find foci, eccentricity and vertices of the ellipse $25x^2 + 9y^2 = 225$
- (xiv) Find the constant α , such that the vectors $\underline{i} - \underline{j} + \underline{k}$, $\underline{i} - 2\underline{j} - 3\underline{k}$ and $3\underline{i} - \alpha\underline{j} + 5\underline{k}$ are coplanar.

SECTION - C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks.

(5 x 8 = 40)

- Q. 3 Show that $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$ where n is an integer and $a > 0$.
- Q. 4 Find the extreme values for the function defined as $f(x) = x^4 - 4x^2$
- Q. 5 Show that $\int \sqrt{a^2 - x^2} dx = \frac{a^2}{2} \sin^{-1} \frac{x}{a} + \frac{x}{2} \sqrt{a^2 - x^2} + C$
- Q. 6 Find an equation of the line through the intersection of the lines $x + 2y + 3 = 0$, $3x + 4y + 7 = 0$ and making equal intercepts on the axes.
- Q. 7 Graph the feasible region and find the corner points of the system of linear inequalities:
 $2x + y \leq 10$, $x + 4y \leq 12$, $x + 2y \leq 10$, $x \geq 0$, $y \geq 0$
- Q. 8 Find area of the triangle with vertices $A(1, -1, 1)$, $B(2, 1, -1)$ and $C(-1, 1, 2)$. Also find a unit vector perpendicular to the plane ABC.
- Q. 9 Find equations of the tangents drawn from $(-7, -2)$ to $(x+1)^2 + (y-2)^2 = 26$.