

Roll No.

--	--	--	--	--	--

Answer Sheet No. 25

Sig. of Candidate. _____

Sig. of Invigilator. _____

MATHEMATICS HSSC-II

SECTION – A (Marks 20)

Time allowed: 25 Minutes

Version Number | 1 | 7 | 4 | 6

Note: Section – A is compulsory. All parts of this section are to be answered on the OMR Answer Sheet provided separately. It should be completed in the first 25 minutes and handed over to the Centre Superintendent along with the Question Paper. 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.

1) Range of $f(x) = x^2 - 1 \quad \forall x \in \mathbb{R}$ is:

- A. \mathbb{R} B. $\{-1, 1\}$ C. $[0, \infty)$ D. $[-1, \infty)$

2) $\lim_{x \rightarrow \infty} 2^x$ is equal to:

- A. 1 B. 0 C. ∞ D. $-\infty$

3) $\cosh^2 x - \sinh^2 x$ is equal to:

- A. 1 B. e^x C. $\cosh 2x$ D. $\tanh x$

4) $f(x) = f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + \dots$ this expansion of $f(x)$ is called _____ series.

- A. Taylor's B. Binomial C. Maclaurin's D. Power

5) If $y = \sin x$ then:

- A. $y - y_2 = 0$ B. $y - y_3 = 0$ C. $y - y_4 = 0$ D. $y + y_4 = 0$

6) $\frac{d}{dx}[\tan^{-1}(-x)]$ is equal to:

- A. $\frac{1}{1+x^2}$ B. $\frac{-1}{1+x^2}$ C. $\frac{1}{x^2-1}$ D. $\frac{1}{1-x^2}$

7) Derivative of $\cot x^2$ w.r.t x^2 is:

- A. $\operatorname{cosec} x^2 \cot x^2$ B. $-2x \operatorname{cosec}^2 x$ C. $-\operatorname{cosec}^2 x^2$ D. $2x \cot x$

8) Integral of $a^x \ln a$ is:

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

9) If $y = x^2 - 1$ and x changes from 3 to 3.02 then dy is equal to:

- A. 0.12 B. 0.1204 C. 0.02 D. 0.16

10) Altitudes of a triangle are always:

- A. Concurrent B. Parallel C. Perpendicular D. Equal

11) Distance between the lines $2x + y + 2 = 0$ and $4x + 2y - 3 = 0$ is:

- A. $\frac{7}{\sqrt{6}}$ B. $\frac{-7}{\sqrt{6}}$ C. $\frac{7}{2\sqrt{5}}$ D. $\frac{-7}{2\sqrt{5}}$

DO NOT WRITE ANYTHING HERE

- 12) Length of tangent from the point $P(-1,10)$ to the circle $x^2 + y^2 + x + y - 10 = 0$ is:
A. -10 B. 10 C. 100 D. 102
- 13) Slope of l_1 is m_1 and slope of l_2 is m_2 . l_1 is parallel to l_2 if:
A. $m_1 + m_2 = 0$ B. $m_1 - m_2 = 0$ C. $m_1 m_2 = 1$ D. $m_1 m_2 = -1$
- 14) If $m\hat{i} + \hat{j}$; $\hat{j} + 3\hat{k}$ and $\hat{i} - \hat{k}$ are co-planar vectors then value of m is:
A. 3 B. -3 C. 1 D. -1
- 15) $(\underline{u} \times \underline{v})$ is equal to:
A. $|\underline{u}||\underline{v}|\sin\theta$ B. $|\underline{u}||\underline{v}|\cos\theta$ C. $\underline{v} \times \underline{u}$ D. $-(\underline{v} \times \underline{u})$
- 16) Angle between the vectors $\hat{i} + \hat{j}$ and $\hat{i} + \hat{k}$ is:
A. $\frac{\pi}{2}$ B. $\frac{\pi}{3}$ C. $\frac{\pi}{4}$ D. $\frac{\pi}{6}$
- 17) The conic is a hyperbola if:
A. $e = 0$ B. $e < 1$ C. $e = 1$ D. $e > 1$
- 18) The line $y = mx + c$ will be tangent to the parabola $y^2 = 4ax$ if:
A. $c = \frac{a}{m}$ B. $c = \frac{m}{a}$ C. $c = am$ D. $c = a + m$
- 19) Directrices of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are:
A. $x = 0$ B. $y = 0$ C. $x = \pm \frac{a}{e}$ D. $y = \pm \frac{a}{e}$
- 20) Which of the following point lies inside the circle $x^2 + y^2 = 8$
A. $(-2, -2)$ B. $(3, -4)$ C. $(1, 2)$ D. $(-1, 3)$

For Examiner's use only:

Total Marks:

20

Marks Obtained:

— 2HS 1711-1746 —



MATHEMATICS HSSC-II

26

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) Evaluate $\lim_{x \rightarrow 0} \frac{1 - \cos 2x}{x^2}$
- (ii) For real valued function f . Find $f^{-1}(x)$ and verify $f^{-1}(f(x)) = f(f^{-1}(x)) = x$ where $f(x) = 3x^3 + 7 \quad \forall x \in \mathbb{R}$
- (iii) Differentiate $y = \cos \sqrt{x}$ from the first principle.
- (iv) If $x = \frac{1-t^2}{1+t^2}$; $y = \frac{2t}{1+t^2}$, find $\frac{dy}{dx}$ and prove that $y \frac{dy}{dx} + x = 0$
- (v) Evaluate $\int \sin^{-1} x dx$
- (vi) Evaluate $\int \sqrt{1 + \sin x} dx$
- (vii) Solve the differential equation $(x^2 - yx^2) \frac{dy}{dx} + y^2 + xy^2 = 0$
- (viii) Graph the feasible region, also find the corner points
 $2x + y \leq 10$
 $x + 4y \leq 12$
 $x + 2y \leq 10$
 $x \geq 0, y \geq 0$
- (ix) Convert the equation $2x - 4y + 11 = 0$ into
 (i) Slope - intercept form (ii) Intercepts form (iii) Normal form
- (x) Using slopes, show that the triangle with vertices $A(6,1)$ $B(2,7)$ and $C(-6,-7)$ is a right triangle.
- (xi) Find volume of Tetrahedron with the vertices $(0,1,2)$ $(3,2,1)$ $(1,2,1)$ and $(5,5,6)$
- (xii) Prove that $a \times (b + c) + b \times (c + a) + c \times (a + b) = 0$
- (xiii) Find an equation of ellipse with vertices $(0, \pm 5)$, eccentricity $\frac{3}{5}$. Also sketch its graph.
- (xiv) Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touch externally.

SECTION - C (Marks 40)

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

(5 x 8 = 40)

- Q. 3 Find the value of m and n , so that the given function is continuous $f(x) = \begin{cases} mx & \text{if } x < 3 \\ n & \text{if } x = 3 \\ -2x + 9 & \text{if } x > 3 \end{cases}$
- Q. 4 Discuss $f(x) = \sin x + \frac{1}{2\sqrt{2}} \cos 2x$ for extreme values in the interval $(0, 2\pi)$
- Q. 5 Evaluate the definite integral $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \frac{\cos x}{\sin x(2 + \sin x)} dx$
- Q. 6 A farmer possesses 100 canals of land and wants to grow corn and wheat. Cultivation of corn requires 3 hours per canal, while cultivation of wheat requires 2 hours per canal. Working hours cannot exceed 240. If he gets a profit of Rs.20/- per canal for corn and Rs.15/- per canal for wheat. How many canals of each he should cultivate to maximize his profit?
- Q. 7 Find the area of region bounded by triangle whose sides are $7x - y - 10 = 0$; $10x + y - 41 = 0$; $3x + 2y + 3 = 0$
- Q. 8 Prove that in any triangle ABC $a = b \cos \gamma + c \cos \beta$
- Q. 9 A parabolic arch has a 100m base and height 25m. Find the height of the arch at a point 30m from the centre of base.