to be filled in by the candidate

HSSC-(P-II)-A/2023

Marks : 80

.hematics (Subjective)

(For All Sessions)
(GROUP-I)

Time: 2:30 hours

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Express perimeter P of a square as a function of its area A.

ii. Evaluate $\lim_{x\to 0} \frac{\sin x^0}{x}$

iii. Define even function with example.

iv. If $y = x^4 + 2x^2 + 2$, prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$

v. Find derivative by definition $\frac{1}{\sqrt{x}}$

vi. Find $\frac{dy}{dx}$; $xy + y^2 = 2$

vii. Differentiate w.r.t x, $y = x^2 sec4x$

viii. Differentiate w.r.t x, $y = cot^{-1}\left(\frac{x}{a}\right)$

ix. Find $\frac{dy}{dx}$ if $y = x\sqrt{lnx}$

x. Apply the Maclaurin series to prove that: $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \cdots$

xi. Graph the solution set of $2x + y \leq 6$.

xii. Define feasible region.

3. Write short answers of any eight parts from the following: (8x2=16)

i. Evaluate $\int tan^2 x dx$.

ii. Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)} dx$

iii. Evaluate $\int x\, sinx dx$.

iv. Evaluate $\int_{\pi/6}^{\pi/3} cost\, dt$

v. Solve the differential equation $y\, dx + x\, dy = 0$

vi. Evaluate $\int \frac{x^2}{4+x^2} dx$

vii. Find the areas between the $x-axis$ and the curve $y = x^2 + 1$ from, $x = 1$ to $x = 2$

viii. Find a unit vector in the direction of $\underline{V} = \frac{1}{2}\underline{i} + \frac{\sqrt{3}}{2}\underline{j}$

ix. Find direction cosines of $\underline{V} = 4\underline{i} - 5\underline{j}$

x. Find $\propto$, so that vector $\underline{u} = 2\propto \underline{i} + \underline{j} - \underline{k}$, $\underline{v} = \underline{i} + \propto \underline{j} + 4\underline{k}$ are perpendicular.

xi. Find the area of parallelogram whose vertices are: $A(0,0,0)$ $B(1,2,3)$ $C(2,-1,1)$ $D(3,1,4)$

xii. A force $\vec{F} = 7\underline{i} + 4j - 3\underline{k}$ is applied at $p(1,-2,3)$. Find its amount about the point $Q(2,1,1)$

4. Write short answers of any nine parts from the following: (9x2=18)

i. Is $(\sqrt{176}, 7)$ at a distance of 15 units from the origin?

ii. By means of slopes, show that the print $(-4,6)$; $(3,8)$; $(10,10)$ lie on the same line.

iii. Find K so that the line joining $A(7,3)$; $B(k,-6)$ and the line joining $C(-4,5), D(-6,4) are\ parallel.$

iv. Find the equation of the line having $y - intercept - 7$ and $slope - 5$.

v. Find the point of intersection of the lines $x - 2y + 1 = 0$ and $2x - y + 2 = 0$

vi. Find equation of lines represented by $2x^2 + 3xy - 5y^2 = 0$

vii. Find the measure of the angle between the lines represented by $9x^2 + 24xy + 16y^2 = 0$

viii. Find an equation of the circle with ends of diameter at $(-3,2)$ and $(5,-6)$

ix. Show that the line $2x + 3y - 13 = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$

x. Check the position of the point $(5,6)$ with respect to the circle $x^2 + y^2 = 81$.

xi. Find focus and directrix of the parabola $x^2 = -16y$

xii. Find an equation of ellipse if foci $(-3\sqrt{3}, 0)$and vertices $(\pm 6, 0)$.

xiii. Find equation of hyperbola with given data foci $(0, \pm 9)$, directrices $y = \pm 4$

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Evaluate: $\lim_{x\to 0} \frac{Secx - Cosx}{x}$

(b) If $y = \tan(2\, tan^{-1}\frac{x}{2})$, then show that $\frac{dy}{dx} = 4(\frac{1+y^2}{4+x^2})$

6. (a) Evaluate: $\int \frac{dx}{\frac{1}{7}Sinx + \frac{\sqrt{3}}{7}Cosx}$

(b) Find equation of line through intersection of $x + 2y + 3 = 0$, $3x + 4y + 7 = 0$ and making equal intercepts on the axes.

7. (a) Find the area bounded by the curve $f(x) = x^3 - 2x^2 + 1$and $x - axis$ in the 1st quadrant.

(b) Minimize $Z = 3x + y$ subject to the constraints $3x + 5y \geq 15$ $x + 6y \geq 9$ $x \geq 0$, $y \geq 0$

8. (a) If $y = a\cos(lnx) + b\, sin(lnx)$ prove that $x^2\frac{d2y}{dx^2} + x\frac{dy}{dx} + y = 0$

(b) Find the coordinates of the points of intersection of the line $2x + y = 5$ and the circle $x^2 + y^2 + 2x - 9 = 0$, also find the length of intercepted chord.

9.(a) Find the centre foci , accentricity and vertices of the ellipse
$x^2 + 16x + 4y^2 - 16y + 76 = 0$