KRISHNAGAR ACADEMY
HALF-YAERLY (PHASE-II) EXAMINATION
CLASS-XII
SUBJECT-MATHEMATICS **FULL MARKS: 50**
Attempt all questions

Question 1. (4x1=4)

a) If $\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$, then the value of $y + x + yx$ is

(i) 1 (ii)$\sqrt{3}$ (iii) $\frac{1}{\sqrt{3}}$ (iv) -1

b) If A and B are square matrices of the same order, then the value of (A+B)(A–B) is equal to

(i) A^2 — B^2 (ii)$A^2 - BA - AB - B^2$

(iii) $A^2 - B^2 + BA - AB$ (iv) $A^2 - BA + B^2 + AB$

c) The value of $\int \frac{1}{e^x + e^{-x}} dx$ is

(i) $\tan^{-1}(e^{-x}) + c$ (ii) $\tan^{-1}(e^x - e^{-x}) + c$

(iii) $\tan^{-1}(e^x) + c$ (iv) $\tan^{-1}(e^x + e^{-x}) + c$

d) The order and degree of the differential equation $xy\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0$ are

(i) Order 2, Degree 1 (ii)Order 1, Degree 1

(iii) Order 1, Degree 2 (iv) Order 2, Degree 2

Question 2.

Evaluate: $\int \tan x \tan 2x \tan 3x \, dx$ (2)

Question 3.

Prove that $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$ (2)

Question 4.

If $A = \begin{bmatrix} 5 & a \\ b & 0 \end{bmatrix}$ and A is symmetric matrix, show that $a = b$ (2)

Question 5.

Find the point on the curve $y = (x-3)^2$, where the tangent is parallel to the line joining $(4, -1)$ and $(5, 0)$. (4)

Question 6.

Find the intervals on which the function $f(x) = \frac{x}{x^2+1}$ is strictly increasing and/or strictly decreasing. (4)

Question 7.

Evaluate: $\int \tan^{-1}\sqrt{x}\, dx$ (4)

Question 8.

Solve the differential equation $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$ (4)

Question 9.

Solve the system of linear equation $x - 2y = 10, 2x - y - z = 8, -2y + z = 7$ (6)

Question 10.

Solve the equation for x: $\sin^{-1}\frac{5}{x} + \sin^{-1}\frac{12}{x} = \frac{\pi}{2}, \; x \neq 0$ (6)

Question 11.

Evaluate: $\int_0^{\pi/4} \log(1 + \tan x)\, dx$ (6)

Question 12.

Show that the rectangle of maximum perimeter which can be inscribed in a circle of radius 10 cm is a square of side $10\sqrt{2}$ cm. (6)