

(C) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

f. The order and degree of differential equation $\frac{dy}{dx} + \sin\left(\frac{dy}{dx}\right) = 0$ is

(A) O = 1, D = 2

(B) O = 1, D = not defined

(C) O = 2, D = 1

(D) O = 1, D = 1

g. The 4th term from the end in the expansion of $\left(\frac{3}{x^2} - \frac{x^3}{6}\right)^7$ is

(A) $\frac{35x^6}{48}$

(B) $\frac{25x^6}{28}$

(C) $\frac{25x^4}{18}$

(D) $\frac{37x^4}{28}$

h. The value of $\sin^4\left(\frac{\pi}{8}\right) + \sin^4\left(\frac{3\pi}{8}\right) + \sin^4\left(\frac{5\pi}{8}\right) + \sin^4\left(\frac{7\pi}{8}\right)$ is

(A) $\frac{1}{2}$

(B) $\frac{3}{4}$

(C) $\frac{3}{2}$

(D) $\frac{1}{4}$

i. The slope is equal to the line $2x - 3y + 5 = 0$ is

(A) $\frac{2}{3}$

(B) $\frac{5}{3}$

(C) $\frac{1}{2}$

(D) $\frac{5}{2}$

j. The points A(0,-2), B(3,1), C(0,4) and D(-3,1) are the vertices of a

(A) parallelogram

(B) rectangle

(C) square

(D) rhombus

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

Q.2 a. If $\cos^{-1}\left(\frac{x^2 - y^2}{x^2 + y^2}\right) = \tan^{-1} a$, then prove that $\frac{dy}{dx} = \frac{y}{x}$. (8)

b. Find the maximum and minimum values of $y = \tan x - 2x$. (8)

Q.3 a. Evaluate $\int x^2 \tan^{-1} x \cdot dx$. (8)

b. Evaluate $\int_0^{\pi/2} x^2 \cos^2 x dx$. (8)

Q.4 a. Find the matrix A satisfying the equation $\begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}^A \begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$. **(8)**

b. Solve the following system of equations using Cramer's rule

$$\begin{cases} 5x - 7y + z = 11 \\ 6x - 8y - z = 15 \\ 3x + 2y - 6z = 7 \end{cases} \quad \text{(8)}$$

Q.5 a. Solve $3x^2 dy = (3xy + y^2) dx$. **(8)**

b. Solve $\cos^2 x \frac{dy}{dx} + y = \tan x$ **(8)**

Q.6 a. Find the term independent of x in the expansion of $\left(2x - \frac{1}{x}\right)^{10}$. **(8)**

b. In a set of four numbers, the first three are in G.P. and the last three are in A.P., with common difference 6. If the first is the same as the fourth. Find the four numbers. **(8)**

Q.7 a. Show that $\tan 20^\circ \cdot \tan 40^\circ \cdot \tan 60^\circ \cdot \tan 80^\circ = 3$. **(8)**

b. The sides of a triangle are $x^2 + x + 1$, $2x + 1$ and $x^2 - 1$ then prove that its largest angle is 120° . **(8)**

Q.8 a. If P and P' be the perpendicular from the origin upon the straight lines $x \sec \theta + y \operatorname{cosec} \theta = a$ and $x \cos \theta - y \sin \theta = a \cos 2\theta$, then prove that, $4P + P'^2 = a^2$. **(8)**

b. Show that the perpendicular drawn from the point (4, 1) on the line segment joining (6, 5) and (2, -1) divides it internally in the ratio 8:5. **(8)**

Q.9 a. Find the equation of the circle which passes through the points (1, -2) and (4, -3) and has its centre on line $3x + 4y = 7$. **(8)**

b. Find the vertex, focus, directrix, axis and latus-rectum of the parabola $y^2 = 4x + 4y$. **(8)**