

**Biyani Girls college ,Jaipur**

**Pre University Paper**

**MSc(Chem)**

**Subject: Mathematics**

**Max Marks:25**

**Attempt any five questions in all selecting atleast one question from each unit.**

**Q.1(a) solve the equations**

$$-x + 3y + z = 1$$

$$2x + 5y = 3$$

$$3x + y - 2z = -2$$

**(b) Find the eigenvalues and eigenvectors of the following matrix.**

$$A = \begin{pmatrix} 2 & 7 \\ -1 & -6 \end{pmatrix}$$

Or

(a) If  $f(x,y,z) = 3x^2 - y^3z^2$  find  $\text{grad } f$  and  $|\text{grad } f|$  at  $(1, -2, 1)$

(b) Find the angle between two vectors

$$a = i - j - 2k$$

$$b = 3i - 5j - 4k$$

**Q.2 Differentiate**

b)  $\tan^{-1} \frac{x^4 e^{\tan^{-1} x}}{\sin x}$

or

(a) Show that  $\sin x(1 + \cos x)$  is maximum at  $x = \frac{\pi}{3}$  in the interval  $[0, \pi]$

(b) Find  $\frac{dy}{dx}$  if  $x^y = e^{x-y}$

Q.3  $\int \frac{2x dx}{(x-1)(x+1)}$

$$\int x^3 \ln x$$

Or

(a) Find the area of the region bounded by the line  $x=4$  and the parabola  $y^2=8x$

(b)  $\int \cos^2 x$

Q.4 Solve the differential Equation

$$(1+y^2)xdx = (1+x^2)dy$$

$$(y^2 - x^2)dx = 2xydy$$

Or

$$Y \sin 2x dx - (1+y^2 + \cos^2 x) dy = 0$$

$$(x + 2y^3)dy = ydx$$

Q.5 (a) Out of 6 boys and 4 girls a committee of 5 is to be formed. How many such a committees can be formed including

(i) at least one girl

(ii) 3 boys and 2 girls

(b) In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

or

(c) What is the probability of getting a sum 9 from two throws of a dice?

(d) What is the probability that a leap year selected at random will contain 53 Mondays?

**Set B**

**Q.1 Solve the Matrix**

(a)  $x + y + z = 6$   
 $2y + 5z = -4$   
 $2x + 5y - z = 27$

(b) Evaluate the determinant

$$\begin{vmatrix} 13 & 16 & 19 \\ 14 & 17 & 20 \\ 15 & 18 & 21 \end{vmatrix}$$

Or

(a) Find Curl  $f$  if

$$F = z^2\vec{i} + x^2\vec{j} + y^2\vec{k}$$

(b) Find the scalar triple products of the vectors

$$\vec{A} = i + 2j - 3k, \vec{B} = 3i + 2j + k, \vec{C} = 3i + 4j + 5k$$

Q.2 Differentiate

a)  $x^4 e^{\tan^{-1}x}$   
b)  $\tan^{-1} \frac{1 - \cos x}{\sin x}$

or

(c) Show that  $\sin x(1 + \cos x)$  is maximum at  $x = \frac{\pi}{3}$  in the interval  $[0, \pi]$

(d) Find  $\frac{dy}{dx}$  if  $x^y = e^{x-y}$

Q.3  $\int \frac{2x dx}{(x-1)(x+1)}$

$$\int x^3 \ln x$$

Or

(b) Find the area of the region bounded by the line  $x=4$  and the parabola  $y^2=8x$

(c)  $\int \cos^2 x$

**Q. 4 Solve**

$$\frac{dy}{dx} = (1+x^2)(1+y^2)$$

(c)  $x^2 dy + (xy + y^2) dx = 0$   
or

$$\frac{dy}{dx} = 1 + x + y + xy$$

$$y(1-x^2) \frac{dy}{dx} = x(1+y^2)$$

**Q.5**

(e) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?

(f) In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

or

(g) What is the probability of getting a sum 9 from two throws of a dice?

(h) From a pack of 52 cards, two cards are drawn together at random. What is the probability of both the cards being kings?



