

## Section-A

Q.1 Choose the correct answer for each from the given options:

(i) In ellipse, the length of semi-latus rectum is:

- (a)  $\frac{b^2}{a}$  (b)  $\frac{a^2}{b}$  (c)  $\frac{2b^2}{a}$  (d) None of these

(ii) Two circles are said to be concentric circle if they have same:

- (a) Diameter (b) Radius (c) Centre (d) Origin

(iii)  $\int \frac{e^{ax}}{x^2} dx =$  \_\_\_\_\_

- (a)  $e^{\frac{1}{a}} + c$  (b)  $e^{\frac{1}{4}} + c$  (c)  $-e^{\frac{1}{2}} + c$  (d)  $-e^{\frac{1}{a}} + c$

(iv) If  $y = 2 \sin x + 3 \cos x$  then,

- (a)  $\frac{d^2 y}{dx^2} = 0$  (b)  $y = \frac{d^2 y}{dx^2} = 0$  (c)  $y + \frac{d^2 y}{dx^2} = 0$  (d) None of these

(v) The minimum value of  $f(x) = x^2 - x - 2$  is:

- (a)  $\frac{5}{4}$  (b)  $\frac{3}{4}$  (c)  $\frac{1}{4}$  (d) None of these

(vi) The line latus rectum is always perpendicular to:

- (a) Axis of conic (b) Directrix (c) Tangent (d) None of these

(vii)  $y \cos \alpha + x \sin \alpha - p$  is known as.

- (a) Slope intercept form (b) Two intercept form  
(c) Perpendicular form (d) None of these

(viii)  $\int e^x (\sin x + \cos x) dx =$  \_\_\_\_\_

- (A)  $e^x \sin x + c$  (b)  $e^x \cos x + c$   
(c)  $-e^x \sin x + c$  (d)  $-e^x \cos x + c$

(ix) If the hyperbola is then foci be.

- (a) (b) (c) Origin (d) None of these

(x) The vector with double the length of  $3i - 4j + 2k$  is:

- (a)  $2i + 8j + 4k$  (b)  $2i + 6j + 4k$  (c)  $6i - 8j + 4k$  (d)  $3i - 4j + 2k$

(xi) Which of the following is not a function?

- (a)  $\{(3, 2), (4, 6), (1, 4)\}$  (b)  $\{(2, 7), (3, 8), (2, 1)\}$   
(c)  $\{(2, 2), (4, 5), (6, 7)\}$  (d)  $\{(2, 7), (3, 8), (4, 7)\}$

(xii) The ratio of mid point is:

- (a) 2 : 3 (b) 3 : 3 (c) 3 : 2 (d) Not possible

(xiii) The pair of lines as  $ax + 2hxy + by = 0$  and if  $a = -b$  then lines are:

- (a) collinear (b) Parallel (c) Perpendicular (d) Coincide

(xiv)  $\int \cos 2y dy = ?$

- (a)  $-\sin 2y$  (b)  $-\frac{1}{2} \sin 2y$  (c)  $\frac{1}{2} \sin 2y$  (d) None of these

(xv) Two tangents can be drawn to the circle, if a point is:

- (a) Inside the circle (b) Outside the circle (c) One the circle  
(d) None of these

(xvi) If  $y = \sin^{-1} x$

- (a)  $\cos x$  (b)  $2 \sin x$  (c)  $4x \cos x$  (d)  $2x \sin 2x$
- (xvii) If the foot of perpendicular from the origin of a straight line is at (3, -4) then the equation of line is:  
 (a)  $3x - 4y = 25$  (b)  $3x - 4y + 25 = 0$  (c)  $4x + 2y = 25$   
 (d)  $4x - 3y + 25 = 0$
- (xviii)  $\lim_{x \rightarrow 0} \frac{2 \cos^2 x + \sin x}{x^2 \sin x}$   
 (a)  $\frac{1}{2}$  (b)  $\frac{5}{3}$  (c)  $\frac{10}{3}$  (d) None of these
- (xix) Whose centre is (-3, 0)?  
 (a)  $x^2 + y^2 + 6x - 7 = 0$  (b)  $x^2 + y^2 - 6x - 7 = 0$   
 (c)  $x^2 + y^2 - 6y + 7 = 0$  (d) None of these
- (xx)  $\frac{d}{dx} (\sin x) - \frac{d^2}{dx^2} (\cos x) = ?$   
 (a)  $2 \cos x$  (b)  $2 \sin x$  (c) 0 (d) None of these

### Section-B

Note: Solve any TEN of the following questions. Each question carries 05 marks.

Q.2 Define Even function and Odd function. State whether given function are even, odd or neither  
 (i)  $f(x) = \sin x \cos x$  (ii)  $f(x) = x + x$

Q.3 Evaluate:  $\lim_{x \rightarrow 0} \frac{5e^x - 2e^{-x} - 3}{x}$

Q.4 Find the ratio in which origin is the point of division of end points (3,4) and (-6,-8) of the straight line. Also find equation of this line.

Q.5 Find the altitude through the vertex A of the triangle A(4, 7), B(2, -5) and C(-6, 1).

Q.6 Find  $\frac{dy}{dx}$ , if  $y = \tan^{-1} \sqrt{\frac{1 - \cos x}{1 + \cos x}}$

Q.7 Find  $\frac{dx}{dy}$ , if  $e^{\sin y} = \sin^2 y$

Q.8 Find the extreme values of the function  $f(x) = \frac{x^2 + x + 1}{1 - x}$

Q.9 For  $y = \ln(x + \sqrt{x^2 + a^2})$  prove that  $\frac{dy}{dx} = \frac{1}{\sqrt{x^2 + a^2}}$

Q.10 Solve:  $\frac{dy}{dx} = \frac{\sqrt{1 - \cos y}}{\sin y}$ ,  $y(0) = \frac{\pi}{2}$

Q.11 Evaluate:  $\int x^2(x^2 - 1)^{\frac{4}{3}} dx$

Q.12 Find the distance between the centres of two circles.

$$x^2 + y^2 - 2x + 6y - 15 = 0 \text{ and } x^2 + y^2 - 8x + 4y - 44 = 0$$

Q.13 Find the eccentricity of hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  whose major axis is half of its latus rectum.

Q.14 Solve:  $(a \times b) \div (b \times c)$  for  $a = 2i + 3j + k$ ,  $b = i - 2j + k$  and  $c = i + 2j - 3k$ .

### Section-C

Note: Solve any THREE of the following questions.

Q.15(a): Given four points in a plane A(1, -2), B(2, 1), C(3, 2) and D(-2, 3). Find the resolution of  $\vec{AD}$  in the direction of  $\vec{AB}$  and  $\vec{AC}$ .

(b) Find the distance between foci of ellipse:  $9x^2 + 13y^2 = 117$

Q.16(a): Solve by first principle method on  $f(x) = \cos \sqrt{x}$

(b) Find the equations of tangent and normal at the point (3, 6) to the parabola  $y - 1 = 3x = 0$ .

Q.17(a): Find the Orthocentre of the triangle formed by the lines,  $x - 3y - 2 = 0$ ,  $x + y - 6 = 0$  and  $5x - 3y + 2 = 0$ .

(b) Find the area above the x-axis  $y = 5 \cos x$ ,  $a = 0$ ,  $b = \frac{\pi}{6}$

Q.18(a): Show that the segments joining the mid points of any two sides of a triangle is parallel to the third side and equal to one half its length.

(b) Find the approximate value of  $\operatorname{cosec} 29^\circ$ .

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