OBJECTIVE

Q. 7: Some possible answers to each statement are given below. Tick (P) mark the correct answer.

i) if 'P' is the parameter of a square and 'A' is its area, then P = :

a) $\sqrt{A}$ b) $2\sqrt{A}$ c) $3\sqrt{A}$ d) $4\sqrt{A}$

ii) $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ = :

a) 0 b) 1 c) 2 d) e

iii) $\frac{d}{dx}(x^n)$

a) nx^{n+1} b) nx^{n-1} c) $(n-1)x^{n-1}$ d) $(n-1)x$

iv) Let $\frac{d}{dx}(\ln x)$:

a) 0 b) $\frac{1}{x}$ c) 1 d) e^x

v) if $y=e^{2x}$, then y_4 =

a) $16e^{2x}$ b) $8e^{2x}$ c) $4e^{2x}$ d) $2e^{2x}$

vi) $\int x^n dx$ = :

a) $\frac{x^{n+1}}{n+1}+c$ b) $\frac{x^{n-1}}{n-1}+c$ c) x^n+c d) $x^{n-1}+c$

vii) $\int \sec x\cdot dx$ =

a) $\ell n(Secx+\tan x)+c$ b) $\ell n(\cos ecx-\cot x)+c$
c) $\ell n(Secx-\tan x)+c$ d) $\ell n(\tan x-\sec x)+c$

viii) $\int \ell nxdx$ = :

a) $x\ell nx-x+c$ b) $x\ell nx+x+c$
c) $x^2\ell nx+c$ d) $x\ell nx-\frac{x^2}{2}+c$

ix) $\int_0^{\pi/6}\sin xdx$ = :

a) $1+\frac{\sqrt{3}}{2}$ b) $1-\frac{\sqrt{3}}{2}$ c) $\frac{1}{2}$ d) -2

x) The solution of differential equation $\frac{dy}{dx}=Cosx$ is :

a) $y=\cos x+c$ b) $y=\tan x+c$
c) $y=\sin x+c$ d) $y=\cot x+c$

xi) The mid point of the line joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$

a) $\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$ b) $\left(\frac{x_1+y_1}{2},\frac{x_2+y_2}{2}\right)$
c) $\left(\frac{x_1-x_2}{2},\frac{y_1-y_2}{2}\right)$ d) $\left(\frac{x_2-x_1}{2},\frac{y_2-y_1}{2}\right)$

xii)The perpendicular distance of a line $12x + 5y = 7$ is :

a) $\frac{1}{13}$ b) $\frac{13}{7}$ c) $\frac{7}{13}$ d) 13

xiii) $2x + 3y < 0$ is :

a) An equation b) Inequality
c) Identity d) Not identity

xiv) Equation of a circle with centre at (0 , 0) and radius = $\sqrt{5}$:

a) $x^2 + y^2 = 5$ b) $x^2 + y^2 = 25$
c) $-x^2 + y^2 = 25$ d) $x^2 - y^2 = 25$

xv) Slope of the tangent to parabola $y^2 = 4ax$ at (a , $2a$) is :

a) -1 b) 1 c) 2 d) 3

xvi) The length of the Latus Rectum of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is :

a) $\frac{2b^2}{a}$ b) $\frac{b^2}{2a}$ c) $\frac{2a^2}{b}$ d) $\frac{a^2}{2b}$

xvii) Transverse axis of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is :

a) $x = \frac{a}{e}$ b) $y = \frac{a}{e}$ c) $x = 0$ d) $y = 0$

xviii) Equation of the normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at (x_1 , y_1) is :

a) $\frac{xx_1}{a^2} + \frac{yy_1}{b^2} = 1$ b) $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$
c) $\frac{a^2x}{x_1} - \frac{b^2y}{y_1} = a^2 - b^2$ d) $xx_1 + yy_1 = a^2b^2$

xix) if $P = (2, 3)$, $Q = (6, -2)$, then $\overrightarrow{PQ}$ is :

a) $4\hat{\underline{i}} + 5\hat{\underline{j}}$ b) $-4\hat{\underline{i}} + 5\hat{\underline{j}}$
c) $4\hat{\underline{i}} - 5\hat{\underline{j}}$ d) $5\hat{\underline{i}} - 4\hat{\underline{j}}$

xx)if $\vec{A}$, $\vec{B}$ are parallel, then $\vec{A} \times \vec{B}$ is :

a) 0 b) 1 c) -1 d) 2

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Section – I

Note: *All questions are to be attempted on answer book.*

Q #2: Write any TWENTY-FIVE short answers of the following questions: 50

(i) Find the domain of $g(x)=\sqrt{x^2-4}$

(ii) Evaluate $\lim\limits_{x\to 0}\dfrac{x}{\tan x}$

(iii) Define continuous function.

(iv) Differentiate $\dfrac{a+x}{a-x}$ w. r. to x.

(v) Differentiate $\cos\sqrt{x}+\sin\sqrt{x}$ w. r. to x.

(vi) Find $\dfrac{dy}{dx}$ if $y=\sinh^{-1}(x^3)$

(vii) If $y=x^2\cdot e^{-x}$, find y_2 .

(viii) Determine the interval for which $f(x)=4-x^2$; $x\in(-2,2)$

(ix) Use differential to find the value of $\dfrac{dy}{dx}$ if $x^2+2y^2=16$

(x) Evaluate $\int\sqrt{1-\cos(2x)}\cdot dx$

(xi) Evaluate $\int a^{x^2}\cdot x\cdot dx$

(xii) Evaluate $\int x\cdot \ell nx\cdot dx$

(xiii) Evaluate $\int\dfrac{2a}{x^2-a^2}\cdot dx$; $x>a$

(xiv) Define definite integral.

(xv) Find the area between x-axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$

(xvi) Solve the differential equation $\dfrac{dy}{dx}=\dfrac{1-x}{y}$

(xvii) Find the coordinates of a point that divides the join of $A(-6, 2)$ and $B(5, -2)$ in the ratio $2:3$

(xviii) Define the inclination of a line.

(xix) Check whether the point $(-2, 4)$ lies above or below the line $4x + 5y - 3 = 0$

(xx) Check whether the three points $A(1, 4)$, $B(2, -3)$, $C(3, -10)$ are collinear or not

(xxi) Find the angle from the line with slope $-\dfrac{7}{3}$ to the line with slope $\dfrac{5}{2}$

(xxii) Find the measure of the angle between the lines represented by $x^2-xy-6y^2=0$.

(xxiii) What is linear inequality?

(xxiv) What is feasible solution set?

(xxv) Define Objective function.

(xxvi) Find the centre and radius of circle $4x^2+4y^2-8x+12y-25=0$

(xxvii) Find the vertex and focus of parabola $x^2-4x-8y+4=0$

(xxviii) find the foci and eccentricity for ellipse $25x^2+9y^2=225$

(xxix) Find equation of hyperbola with foci (0 ± 6) , $e=2$

(xxx) Find the equation of tangent to $3x^2-7y^2+2x-y-48=0$

(xxxi) Find the equation of $9x^2-4y^2+36x+8y-4=0$ with respect to the origin (-2,1)

(xxxii) Write the condition that $ax^2+2hxy+by^2+2gx+2fy+c=0$ may be a parabola

(xxxiii) If α, β, γ, are the direction angles of a vector then prove that

$$\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$$

(xxxiv) Find projection of $\bar{u}=3\bar{i}+\bar{j}-\bar{k}$ on $\bar{v}=-2\bar{i}-\bar{j}+\bar{k}$

(xxxv) Find a vector perpendicular to $\underline{a} = \hat{\underline{i}} + \hat{\underline{j}}$, $\underline{b} = \hat{\underline{i}} - \hat{\underline{j}}$.

(xxxvi) Find α so that $\alpha\hat{\underline{i}} + \hat{\underline{j}}$, $\hat{\underline{i}} + \hat{\underline{j}} + 3\hat{\underline{k}}$ and $2\hat{\underline{i}} + \hat{\underline{j}} - 2\hat{\underline{k}}$.

(xxxvii) Find the volume of parallelepiped with edges $\underline{u} = 3\hat{\underline{i}} + 2\hat{\underline{k}}$, $\underline{v} = \hat{\underline{i}} + 2\hat{\underline{j}} + \hat{\underline{k}}$, $\underline{w} = -\hat{\underline{j}} + 4\hat{\underline{k}}$

Section - II

***Note:** Attempt any THREE questions. (5+5 marks each question)*

Q # 3 (a) If $f(x) = \begin{cases} \dfrac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} , & x \neq 2; \\ k , & x = 2. \end{cases}$

Find the value of k so that f is continuous at $x = 2$.

(b) Find y_4 if $y = \cos^3 x$.

Q # 4 (a) Evaluate $\int \sqrt{a^2 + x^2}\, dx$ **(b)** Evaluate $\int_0^1 \frac{3x}{\sqrt{4-3x}} dx$

Q # 5 (a) Find the distance of the point (x_1, y_1) from the line $ax + by + c = 0$

(b) Graph the feasible region of the following system of linear inequalities and find the corner points

$$2x + 3y \leq 18 ,$$
$$x + 4y \leq 12 ,$$
$$3x + y \leq 12 ,$$
$$x \geq 0, \ y \geq 0 .$$

Q # 6 (a) Write equation of circle passing through the given points

$A(4 , 5)$, $B(-4 , -3)$, $C(8 , -3)$

(b) Find centre , foci , eccentricity , vertices and directrices of the ellipse

$$x^2 + 16y + 4y^2 - 16y + 76 = 0 .$$

Q # 7 (a) Find the projection of $\underline{a}$ along $\underline{b}$ when $\underline{a} = [3,1,-1]$ and $\underline{b} = [-2,-1,1]$.

(b) Find the area of the triangle using vector method having vertices

$(1,-1,1)$, $(2,1,-1)$, $(-1,1,2)$

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