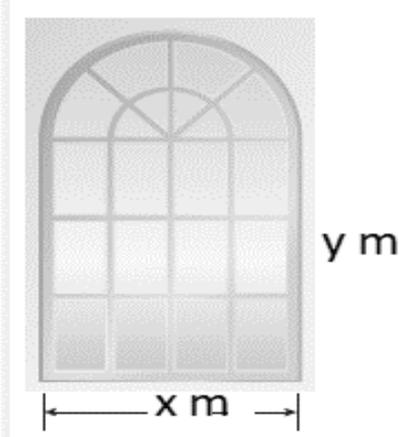


8.	Direction cosines of the line $\frac{x-1}{2} = \frac{1-y}{3} = \frac{2z-1}{12}$ are (a) $\frac{2}{7}, \frac{3}{7}, \frac{6}{7}$ (b) $\frac{2}{\sqrt{157}}, -\frac{3}{\sqrt{157}}, \frac{12}{\sqrt{157}}$ (c) $\frac{2}{7}, -\frac{3}{7}, -\frac{6}{7}$ (d) $\frac{2}{7}, -\frac{3}{7}, \frac{6}{7}$
9.	If two vectors \vec{a} and \vec{b} are such that $ \vec{a} = 2, \vec{b} = 5, \vec{a} \cdot \vec{b} = 8$ then the value of $ \vec{a} - \vec{b} $ is (a) $\sqrt{13}$ (b) 13 (c) 169 (d) 3
10.	The function $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ then $f'(1)$ is? (a) 1 (b) 0 (c) -1 (d) $\frac{1}{2}$
11.	If $P(A) = \frac{4}{5}$ and $P(A \cap B) = \frac{7}{10}$, then $P\left(\frac{B}{A}\right)$ is equal to (a) $\frac{1}{10}$ (b) $\frac{1}{8}$ (c) $\frac{7}{8}$ (d) $\frac{17}{20}$
12.	The degree of the differential equation is $\left(1 + \left(\frac{dy}{dx}\right)^2\right)^3 = \left(\frac{d^2y}{dx^2}\right)^4$ is (a) 2 (b) 3 (c) 6 (d) 4
13.	If A is a square matrix of order 3 has $ A =4$, then the value of $ A \text{ adj } A $ is equals to a) 32 (b) 16 (c) 64 (d) None of these
14.	The integrated factor of the differential equation: $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$ is $\frac{1}{e^{\tan^{-1}x}}$ (b) $2e^{\tan^{-1}x}$ (c) $3e^{\tan^{-1}x}$ (d) $e^{\tan^{-1}x}$
15.	Direction cosines of the vector \vec{AB} joining the point $A(-1, -2, 3)$ and $B(1, 2, -1)$ is a) $\left\langle \frac{1}{3}, \frac{2}{3}, \frac{-2}{3} \right\rangle$ (b) $\langle 2, 4, -4 \rangle$ (c) $\left\langle \frac{2}{\sqrt{6}}, \frac{4}{\sqrt{6}}, \frac{-4}{\sqrt{6}} \right\rangle$ (d) $\left\langle \frac{-1}{\sqrt{3}}, \frac{-2}{3}, \frac{1}{3} \right\rangle$
16.	Find the projection of the vector $\hat{i} - \hat{j} + 3\hat{k}$ on the vector $\hat{i} - 2\hat{j} + 5\hat{k}$ (a) $\frac{18}{\sqrt{30}}$ (b) $\frac{14}{30}$ (c) $\frac{7}{15}$ (d) $\frac{14}{\sqrt{30}}$
17.	The value of the integral $\int_{-\pi}^{\pi} \sin^{-1}x dx$ is a) π (b) $-\pi$ (c) 0 (d) 2π
18.	The position vectors of two points A and B are respectively $6\vec{a} + 2\vec{b}$ and $\vec{a} - 3\vec{b}$. If the point C divides AB internally in the ratio 3: 2 then the position vector of C is ? a) $3\vec{a} - \vec{b}$ (b) $3\vec{a} + \vec{b}$ (c) $\vec{a} + \vec{b}$ (d) $\vec{a} - \vec{b}$
QUESTION19 & 20 BASED ON REASONING AND ASSERTION	
In the following questions a statement of Assertion (A) is followed by a statement of Reason(R). Pick the correct option:	
a) Both (A) and (R) are True and R is the correct Explanation of (A) b) Both (A) and (R) are True and R is not the correct Explanation of (A) c) (A) is True but (R) is False d) (A) is False but (R) is True	
19.	Assertion (A): Let N be the set of all natural numbers and R be a relation in N defined by $R = \{(a,b): a \text{ is a multiple of } b\}$. Then R is reflexive and transitive but not symmetric. Reason (R): A relation R is an equivalence relation if R is reflexive and symmetric only.
20.	Assertion (A): A balloon, which always remains spherical, has a variable radius. The rate, at which its volume is increasing with the radius when the radius is 10 cm, is $400\pi \text{ cm}^3 / \text{cm}$.

	<p>Reason (R): Rate of change of volume (v) of balloon with respect of radius (r) is</p> $\frac{dv}{dr} = \left(\frac{4}{3}\pi\right) \cdot 3r^2$
SECTION B (10 MARKS)	
21.	<p>Find the value of $\cot^{-1}(-1) + \operatorname{cosec}^{-1}(-\sqrt{2})$.</p> <p style="text-align: center;">OR</p> <p>Find the value of $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$.</p>
22.	Show that $f(x) = (x - 1)e^x + 1$ is a strictly increasing function for all $x > 0$.
23.	<p>Find the maximum profit that a company can make, if the profit function is given by $p(x) = 41 + 72x - x^2$ where x is the number of units and p(x) is the profit in rupees.</p> <p style="text-align: center;">OR</p> <p>The volume of a cube is increasing at a constant rate .Prove that the increase in surface area varies inversely as the length of the edge of the cube.</p>
24.	Evaluate: $\int_0^{\frac{\pi}{2}} x \cos x \, dx$.
25.	At what points in the interval $[0, 2\pi]$, does the function $\sin 2x$ attain its maximum value?
SECTION C (18 MARKS)	
26.	Find : $\int \frac{3x+1}{(x-2)^2(x+2)} dx$
27.	<p>The probabilities of a specific problem being solved independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability that</p> <p>(i) The problem is solved</p> <p>(ii) Exactly one of them solves the problem.</p>
28.	<p>Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\cot x}}$</p> <p style="text-align: center;">OR</p> <p>Evaluate: $\int x \tan^{-1} x \, dx$</p>
29.	<p>Solve the differential equation: $(1 + x^2) \frac{dy}{dx} + y = e^{\tan^{-1} x}$</p> <p style="text-align: center;">OR</p> <p>Solve the differential equation $x \, dy - y \, dx = \sqrt{x^2 + y^2} \, dx$</p>
30.	<p>Solve the following Linear Programming Problem graphically:</p> <p>Maximize: $Z = 100x + 120y$</p> <p style="text-align: center;">Subject to : $5x + 8y \leq 200, 5x + 4y \leq 120, x, y \geq 0$</p> <p style="text-align: center;">OR</p> <p>Solve the following Linear Programming Problem graphically:</p> <p>Minimise : $z = 4x + 6y$</p> <p>subject to the constraints</p> <p style="text-align: center;">$x + 2y \geq 80, \quad 3x + y \geq 75, \quad x \geq 0, y \geq 0$</p>
31.	If $x = 3\sin t - \sin 3t$ and $y = 3\cos t - \cos 3t$ find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{3}$
SECTION D (20 MARKS)	
32.	Make a rough sketch of the region $\{(x, y): 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$ and find the area of the region using integration.
33.	Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and R be a relation in $A \times A$, defined by $(a, b) R (c, d) \Leftrightarrow a+d = b+c$ for all (a, b) and $(c, d) \in A \times A$. Prove that R is an equivalence relation. Also

	<p>find the equivalence class of (2, 5).</p> <p style="text-align: center;">OR</p> <p>Consider $f: \mathbb{R}_+ \rightarrow [-9, \infty)$ given by $f(x) = 5x^2 + 6x - 9$. Prove that f is bijective.</p>
34.	<p>Using matrix method solve the following system of linear equations:</p> $\begin{aligned} x + 3y + 4z &= 8 \\ 2x + y + 2z &= 5 \\ 5x + y + z &= 7 \end{aligned}$
35.	<p>Find the shortest distance between the lines whose equations are given as:</p> $L_1: \vec{r} = \hat{i} + \hat{j} + \lambda(2\hat{i} - \hat{j} + \hat{k})$ $L_2: \vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu(3\hat{i} - 5\hat{j} + 2\hat{k})$ <p style="text-align: center;">OR</p> <p>Show that the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$ intersect also find their point of intersection.</p>
<p>SECTION E (12 MARKS)</p> <p>This section comprises of 3 case –study/passage based questions of 4 marks each with sub-parts. The first two case study questions have three sub parts (i), (ii) , (iii) of marks 1,1,2 respectively. The third case study question has two sub parts of 2 marks each.</p>	
36.	<p>Dr. Rohan residing in Delhi went to see an apartment of 3BHK in Noida. The window of the house in the form of a rectangle surrounded by a semicircular opening having a perimeter of the window 10 m as shown in the figure</p> <div style="text-align: center;">  </div> <p>(i) If x and y represents the length and breadth of the rectangular region, then what is the relation between the variables.</p> <p>(ii) Dr. Rohan is interested in maximize the area of the whole window. For this to happen what should be value of x?</p> <p style="text-align: center;">OR</p> <p>(ii) For maximum value of area, find the breadth of the rectangular part of the window.</p> <p>(iii) Find the maximum area of window.</p>
37.	<p>A particle is acted upon by constant forces $\vec{F}_1 = 4\hat{i} + \hat{j} - 3\hat{k}$ and $\vec{F}_2 = 3\hat{i} + \hat{j} - \hat{k}$ is displaced from the point $\vec{d}_1 = \hat{i} + 2\hat{j} + 3\hat{k}$ to the point $\vec{d}_2 = 5\hat{i} + 4\hat{j} + \hat{k}$. Now answer the following questions:</p>

	<p>(i) Find the magnitude of $\vec{F}_1 + \vec{F}_2$</p> <p>(ii) Find the scalar product of \vec{F}_2 with \vec{d}_1.</p> <p>(iii) Find the total work done by the forces.</p> <p style="text-align: center;">OR</p> <p>(iii) Find a unit vector perpendicular to the plane containing \vec{d}_1 and \vec{d}_2</p>
38.	<p>Mahindra Tractors is India's leading farm equipment manufacturer. It is the largest tractor selling factory in the world. This factory has two machine A and B. Past record shows that machine A produced 60% and machine B produced 40% of the output(tractors). Further 2% of the tractors produced by machine A and 1% produced by machine B were defective. All the tractors are put into one big store hall and one tractor is chosen at random.</p> <div style="text-align: center;">  </div> <p>(i) Find the total probability of chosen tractor (at random) is defective.</p> <p>(ii) If in random choosing, chosen tractor is defective, then find the probability that the chosen tractor is produced by machine 'A'</p>