INDIAN SCHOOL AL WADI AL KABIR

Class XII, Mathematics

SAMPLE PAPER No. 1, M.C.Q & Case Study, 30-08-2021

Q.1.	For what value of x : $[1 \quad 2 \quad 1]\begin{bmatrix}1 & 2 & 0\\ 2 & 0 & 1\\ 1 & 0 & 2\end{bmatrix}\begin{bmatrix}0\\ 2\\ x\end{bmatrix} = 0$?							
	A	-1	**B**	0	**C**	2	**D**	None of these
Q.2.	The value of x, y, z if the matrix $A = \begin{bmatrix}0 & 2y & z\\ x & y & -z\\ x & -y & z\end{bmatrix}$ which satisfy the equation $AA' = I$.							
	A	$x = \mp\frac{1}{\sqrt{2}}, y = \mp\frac{1}{\sqrt{6}}, z = \mp\frac{1}{\sqrt{3}}$	**B**	$x = \frac{1}{\sqrt{2}}, y = \frac{1}{\sqrt{6}}, z = \frac{1}{\sqrt{3}}$	**C**	$x = \frac{-1}{\sqrt{2}}, y = \frac{-1}{\sqrt{6}}, z = \frac{-1}{\sqrt{3}}$	**D**	None of these
Q.3.	If A is a square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to							
	A	A	**B**	I – A	**C**	I	**D**	3A
Q.4.	If the matrix A is both symmetric and skew-symmetric, then							
	A	A is a diagonal matrix	**B**	A is zero matrix	**C**	A is a square matrix	**D**	None of these
Q.5.	If $A = \begin{bmatrix}\alpha & \beta\\ \gamma & -\alpha\end{bmatrix}$ is such that $A^2 = I$, then							
	A	$1 + \alpha^2 + \beta\gamma = 0$	**B**	$1 - \alpha^2 + \beta\gamma = 0$	**C**	$1 - \alpha^2 - \beta\gamma = 0$	**D**	$1 + \alpha^2 - \beta\gamma = 0$
Q.6.	The value of x, y and z from the equations $\begin{bmatrix}x + y + z\\ x + z\\ y + z\end{bmatrix} = \begin{bmatrix}9\\ 5\\ 7\end{bmatrix}$ are							
	A	$x = 2, y = 4, z = 3$	**B**	$x = 4, y = 2, z = 3$	**C**	$x = 2, y = 3, z = 4$	**D**	None of these
Q.7.	The value of k, a non-zero scalar, if $2\begin{bmatrix}1 & 2 & 3\\ -1 & -3 & 2\end{bmatrix} + k\begin{bmatrix}1 & 0 & 2\\ 3 & 4 & 5\end{bmatrix} = \begin{bmatrix}4 & 4 & 10\\ 4 & 2 & 14\end{bmatrix}$ is							
	A	1	**B**	2	**C**	0	**D**	None of these
Q.8.	If $A = \begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$, then $A^2 - 5A + 7I$ is							
	A	0	**B**	I	**C**	A	**D**	None of these

Q.9.	The value of determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ equal to							
	A	x	**B**	y	**C**	xy	**D**	x^2y^2
Q.10	If A is invertible square matrix then adj (A^T) is							
	A	A^T	**B**	A	**C**	$(\text{Adj A})^T$	**D**	None of these
Q.11	The system of equations x + 2y + 3z = 7, 2x – y – 5z – 13 = 0, -x + y- z – 1 1 = 0 can be written as							
	A	$\begin{bmatrix} x \\ y \\ z \end{bmatrix}\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & -5 \\ -1 & 1 & -1 \end{bmatrix} = \begin{bmatrix} 7 \\ 13 \\ 11 \end{bmatrix}$			**C**	$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & -5 \\ -1 & 1 & -1 \end{bmatrix}\begin{bmatrix} 7 \\ 13 \\ 11 \end{bmatrix}$		
	B	$\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & -5 \\ -1 & 1 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ 13 \\ 11 \end{bmatrix}$			**D**	$\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & -5 \\ -1 & 1 & -1 \end{bmatrix} = [x \quad y \quad z]\begin{bmatrix} 7 \\ 13 \\ 11 \end{bmatrix}$		
Q.12	If $A = \begin{bmatrix} k & 0 & 0 \\ 0 & k & 0 \\ 0 & 0 & k \end{bmatrix}$, then value of $\lvert\text{adj A}\rvert$ is							
	A	k^{27}	**B**	k^9	**C**	k^6	**D**	None of these
Q.13	Find the values of a and b if A = B, where $A = \begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}, B = \begin{bmatrix} 2a+2 & b^2 \\ 8 & b^2\text{-}5b \end{bmatrix}$							
	A	a = 2 & b = 2	**B**	a = -2 & b = 2	**C**	a = -2 & b = -2	**D**	None of these
Q.14	Find x if $A = \begin{bmatrix} \cos x & \sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is a singular matrix							
	A	$\frac{\pi}{2}$	**B**	$\frac{\pi}{4}$	**C**	$\frac{\pi}{3}$	**D**	$\frac{\pi}{6}$
Q.15	Find x if $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & x \end{bmatrix}$ is a singular matrix							
	A	5	**B**	3	**C**	9	**D**	27
Q.16	If $A = \begin{bmatrix} 1 & 2 & 4 \\ 5 & 7 & 8 \\ 9 & 10 & 12 \end{bmatrix}$, find the co-factors of elements of 7 and 12.							
	A	-24 & -3	**B**	24 & -3	**C**	-24 & 3	**D**	None of these
Q.17	There are two values of x which makes, $\begin{vmatrix} 1 & -2 & 5 \\ 2 & x & -1 \\ 0 & 4 & 2x \end{vmatrix} = 86$, then sum of these values is							
	A	4	**B**	5	**C**	-4	**D**	9

Q.18	The number of distinct roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$, in the interval $-\frac{\pi}{4} \le x \le \frac{\pi}{4}$ is							
	A	one	**B**	two	**C**	three	**D**	None of these
Q.19	Let A be square matrix of order 3× 3, then $\lvert kA \rvert$ is equal to							
	A	$k\lvert A\rvert$	**B**	$k^2\lvert A\rvert$	**C**	$k^3\lvert A\rvert$	**D**	$3k\lvert A\rvert$
Q.20	If $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and C_{ij} is co-factors of a_{ij}, then the value of Δ is given by							
	A	$a_{11}C_{31} + a_{12}C_{32} + a_{13}C_{33}$	**B**	$a_{11}C_{11} + a_{12}C_{21} + a_{13}C_{31}$	**C**	$a_{21}C_{11} + a_{22}C_{12} + a_{23}C_{13}$	**D**	$a_{11}C_{11} + a_{21}C_{21} + a_{31}C_{31}$
Q.21.	If $A = [a_{ij}]$ is square matrix of order 3× 3 such that $a_{ij} = i^2 - j^2$, then A is							
	A	Symmetric matirx	**B**	Null matrix	**C**	Skew-symmetric	**D**	Diagonal matrix
Q.22.	If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ which satisfy the equation $A'A =$, then $x + y$ is.							
	A	3	**B**	0	**C**	-3	**D**	I
Q.23.	The value of $\tan\left(2\tan^{-1}\frac{1}{5} - \frac{\pi}{4}\right)$ is							
	A	-7/17	**B**	7/17	**C**	-7/5	**D**	None of these
Q.24.	$\cos^{-1}\sqrt{\frac{1+\sqrt{1+x^2}}{2\sqrt{1+x^2}}}$ is equal to							
	A	$\tan^{-1} x$	**B**	$\frac{1}{2}\tan^{-1} x$	**C**	$\tan^{-1} x^2$	**D**	None of these
Q.25.	For what value of k is the following function continuous at x = 2? $f(x) = \begin{cases} 2x+1, & x < 2 \\ k, & x = 2 \\ 3x-1, & x > 2 \end{cases}$							
	A	5	**B**	3	**C**	2	**D**	None of these
Q.26.	The value of k, a non-zero scalar, if $2\begin{bmatrix} 1 & 2 & 3 \\ -1 & -3 & 2 \end{bmatrix} + k\begin{bmatrix} 1 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 4 & 10 \\ 4 & 2 & 14 \end{bmatrix}$ is							
	A	1	**B**	2	**C**	0	**D**	None of these
Q.27.	The values of x for which $f(x) = \frac{x-2}{x+1}, x \neq -1$ is increasing or decreasing							
	A	Increasing on R - {0}	**B**	Increasing on R - {-1}	**C**	Increasing on R - {1}	**D**	Increasing on R

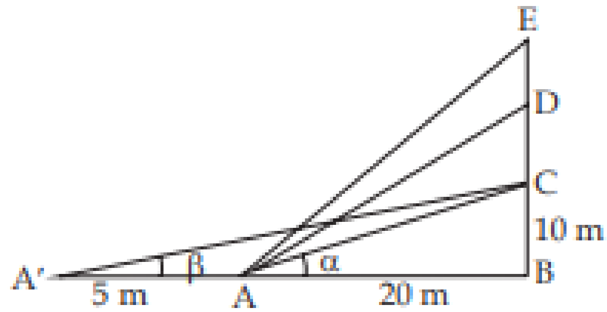
Q.28.	Which of the following functions is strictly increasing on $\left(0, \frac{\pi}{2}\right)$?							
	A	Cos x	**B**	Cos 2x	**C**	Cos 3x	**D**	Tan x
Q.29.	The intervals in which the function $f(x) = \frac{3}{10}x^4 - \frac{4}{5}x^3 - 3x^2 + \frac{36}{5}x + 11$ in increasing							
	A	$(-2, 1) \cup (3, \infty)$	**B**	$(-2, -1) \cup (3, \infty)$	**C**	$(-2, 1) \cup (2, \infty)$	**D**	Increasing on R
Q.30.	The slope of the tangent to the curve $x = t^2 + 3t - 8, y = 2t^2 - 2t - 5$ at the point (2, -1) is							
	A	22/7	**B**	6/7	**C**	7/6	**D**	-6/7
Q.31.	The equation of the normal to the curve $y = \sin x$ at (0, 0) is							
	A	$x = 0$	**B**	$y = 0$	**C**	$x + y = 0$	**D**	$x - y = 0$
Q.32.	The point on the curve $y = x + \frac{1}{x}$ at which tangent is parallel to x - axis							
	A	(1, 2) and (-1, -2)	**B**	(1, 2) and (-1, 2)	**C**	(-1, 2) and (-1, -2)	**D**	None of these
Q.33.	The curves $2x = y^2$ and $2xy = k$ cut at right angles if k^2 is equal to							
	A	8	**B**	4	**C**	2	**D**	None of these
Q.34.	The point on the curve $y = x^2 - 11x + 5$ at which the equation of the tangent is $y = x - 11$							
	A	(2, -9)	**B**	(-2, -9)	**C**	(2, 9)	**D**	None of these
Q.35.	If $x = a\sin^3\theta, y = a\cos^3\theta$, then $\frac{dy}{dx}$ is							
	A	$-\text{Cot}\,\theta$	**B**	$\text{Cot}\,\theta$	**C**	$-\tan\theta$	**D**	None of these
Q.36.	Find $\frac{d^2y}{dx^2}$ when $\theta = \frac{\pi}{2}$ when $x = a(\theta + \sin\theta)$ and $y = a(1 - \cos\theta)$							
	A	-1/a	**B**	2/a	**C**	1/a	**D**	None of these
Q.37.	If $y = \log\sqrt{\frac{1-\cos x}{1+\cos x}}$, then $\frac{dy}{dx}$ is							
	A	Cos x	**B**	Sec x	**C**	Cosec x	**D**	None of these
Q.38.	If $y\log x = x - y$, then $\frac{dy}{dx}$ is							
	A	$\frac{-\log x}{(1+\log x)^2}$	**B**	$\frac{\log x}{(1+\log x)^2}$	**C**	$\frac{\log x}{(1-\log x)^2}$	**D**	None of these

<table>
<tr><th colspan="9">CASE STUDY QUESTION</th></tr>
<tr><td>Q.39.</td><td colspan="8">Sherlin and Danju are playing Ludo at home during Covid-19. While rolling the dice, Sherlin’s sister Raji observed and noted the possible outcomes of the throw every time belongs to set {1, 2, 3, 4, 5, 6}. Let A be the set of players while B be set of all possible outcomes. A = {S, D}, B = {1, 2, 3, 4, 5, 6}

{S, D}, B = {1, 2, 3, 4, 5, 6} Based on the above information answer the following:</td></tr>
<tr><td>(a)</td><td colspan="8">Let R : B $\rightarrow$ B be defined by R = {(x, y) : y is divisible by x} is</td></tr>
<tr><td></td><td>A</td><td>Reflexive and transitive but not symmetric</td><td>B</td><td>Reflexive and symmetric but not transitive</td><td>C</td><td>Not reflexive but symmetric and transitive</td><td>D</td><td>Equivalence Sol</td></tr>
<tr><td>(b)</td><td colspan="8">Raji wants to know the number of functions from A to B. How many number of functions are possible?</td></tr>
<tr><td></td><td>A</td><td>6^2</td><td>B</td><td>2^6</td><td>C</td><td>6!</td><td>D</td><td>2^{12}</td></tr>
<tr><td>(c)</td><td colspan="8">Let R be a relation on B defined by R = {(1, 2), (2, 2), (1, 3), (3, 4), (3, 1), (4, 3), (5, 5)}. Then R is</td></tr>
<tr><td></td><td>A</td><td>Symmetric</td><td>B</td><td>Reflexive</td><td>C</td><td>Transitive</td><td>D</td><td>None of these three</td></tr>
<tr><td>(d)</td><td colspan="8">Raji wants to know the number of relations possible from A to B. How many numbers of relations are possible?</td></tr>
<tr><td></td><td>A</td><td>6^2</td><td>B</td><td>2^6</td><td>C</td><td>6!</td><td>D</td><td>2^{12}</td></tr>
<tr><td>(e)</td><td colspan="8">Let R : B $\rightarrow$ B be defined by R = {(1, 1), (1, 2), (2, 2)(3, 3), (4, 4), (5, 5), (6, 6)}, then R is</td></tr>
<tr><td></td><td>A</td><td>Symmetric</td><td>B</td><td>Reflexive and Transitive</td><td>C</td><td>Transitive and symmetric</td><td>D</td><td>Equivalence</td></tr>
</table>

CASE STUDY QUESTION

Q.40. The Government of India is planning to fix a hoarding board at the face of a building on the road of a busy market for awareness on COVID-19 protocol. Ram, Robert and Rahim are the three engineers who are working on this project. ‘A’ is considered to be a person viewing the hoarding board 20 metres away from the building, standing at the edge of a pathway nearby, Ram Robert and Rahim suggested to the film to place the hoarding board at three different locations namely C, D and E. ‘C’ is at the height of 10 metres from the ground level. For the viewer ‘A’, the angle of elevation of ‘D’ is double the angle of elevation of ‘C’. The angle of elevation of ‘E’ is triple the angle of elevation of ‘C’ for the same viewer.



Look at the figure given and based on the above information answer the following:

(a)	Measure of ∠CAB =							
	A	$\tan^{-1} 2$	**B**	$\tan^{-1}\frac{1}{2}$	**C**	$\tan^{-1} 1$	**D**	$\tan^{-1} 3$
(b)	Measure of ∠DAB =							
	A	$\tan^{-1}\frac{3}{4}$	**B**	$\tan^{-1} 3$	**C**	$\tan^{-1}\frac{4}{3}$	**D**	$\tan^{-1} 4$
(c)	Measure of ∠EAB							
	A	$\tan^{-1} 11$	**B**	$\tan^{-1} 3$	**C**	$\tan^{-1}\frac{2}{11}$	**D**	$\tan^{-1}\frac{11}{2}$
(d)	A’ is another viewer standing on the same line of observation across the road. If the width of the road is 5 meters, then the difference between ∠CAB and ∠CA’B is							
	A	$\tan^{-1}\frac{1}{12}$	**B**	$\tan^{-1}\frac{1}{8}$	**C**	$\tan^{-1}\frac{2}{5}$	**D**	$\tan^{-1}\frac{11}{21}$
(e)	Domain and Range of $\tan^{-1} x = =$							
	A	R+,$\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$	**B**	R-,$\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$	**C**	R,$\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$	**D**	R,$\left(0,\frac{\pi}{2}\right)$

Answers	**1**	A	**2**	A	**3.**	C	**4**	B
	5	C	**6**	A	**7**	B	**8**	A
	9	C	**10**	C	**11**	B	**12**	C
	13	B	**14**	B	**15**	B	**16**	A
	17	C	**18**	A	**19**	C	**20**	D
	21	C	**22**	C	**23**	A	**24**	B
	25	A	**26**	A	**27**	D	**28**	D
	29	A	**30**	B	**31**	C	**32**	A
	33	A	**34**	A	**35**	A	**36**	C
	37	C	**38**	B	**39**	a) A b) A c) D d) D e) B	**40**	a) B b) C c) D d) A e) C