sns academy

an International CBSE Finger Print School
Coimbatore

GRADE XII MATHS

MULTIPLE CHOICE QUESTIONS

1.	If {5 7} and let {5 ,(6 ,(7 ,(5 ,(6 ,(6 ,(7)}.	
	A) Reflexive, symmetric but not Transitive	B)) Symmetric, transitive but not reflexive
	C) Reflexive, Transitive but not symmetric	D) an equivalence relation
2.	Let R be a relation defined on Z as follows: $(a, b$	
	A)){3,4,5}	B)) {0,3,4,5}
	C)){0,±3,±4,±5}	D)) None of these
3.	The maximum number of equivalence relations on the set A= {1 , 2 , 3} is	
	A) 1	B) 2
	C) 3	D)5
4.	Consider the set A= {1, 2}.The relation on A which is symmetric but neither transitive nor reflexive is	
	A){(1,1) (2,2) }	B){ }
	C){(1,2)}	D) { (1,2) (2,1) }
5.	If {d f} and let {(d ,(d ,(e ,(e)}.	
	A) eflexive, symmetric but not Transitive	B) Symmetric, transitive but not reflexive
	C) Reflexive, Transitive but not symmetric	D) an equivalence relation
6.	Let R be a reflexive relation on a finite set A having n elements and let there be m ordered pairs in R,then	
	A)m < n	B)m > n
	C)m = n	D)none of these
7.	The number of elements in set A is 3.The number of possible relations that can be defined on A is	
	A)8	B)4
	C)64	D)512
8.	The number of elements in Set A is 3.The number of possible reflexive relations that can be defined in A is	
	A) 64	B) 8
	C)512	D) 4
9.	The number of elements in set P is 4.The number of possible symmetric relations that can be defined on P is	
	A) 16	B) 32
	C)512	D)1024

10.	N is the set of all natural numbers and R is a relation on N x N defined by (a, b) R (c, d) if and only if a + d = b + c ,then R is
	A)only Reflexive
	B)only symmetric
	C) only transitive
	D) equivalence relation
11.	The relation R defined on the set $A = \{1,2,3,4,5\}, by\ R = \{(a,b): \lvert a^2 - b^2 \rvert > 16\}$ is given by
	A)$\{(1,1),(2,1),(3,1),(4,1),(2,3)\}$
	B)$\{(2,2),(3,2),(4,2),(2,4),\}$
	C)$\{(3,3),(4,3),(5,4),(3,4)\}$
	D) none of these
12.	Let A={p,q,r}.The relation which is not an equival nce relation on A is
	A){(p,p),(q,q),(r,r)}
	B) {(p,p),(q,q),(r,r),(p,q),(q, p)}
	C) {(p,p),(q,q), (r,r),(r,q),(q , r)}
	D) none of these
13.	Let R be a relation on the set N of natural numbers defined by **aRb**if and only if**a divides b**.Then R is
	A) Reflexive and Symmetric
	B) Transitive and Symmetric
	C) equivalence
	D) Reflexive and Transitive but not symmetric
14.	Consider the set A={4,5}.The smallest equivalence relation (i.e the relation with the least number of elements), is
	A) { }
	B) {(4,5)}
	C) {(4,4),(5,5)}
	D) {(4,5),(5,4)}
15.	Let P = {a,b,c}.Then the number of Equivalence relations containing (a,b) is
	A) 1
	B) 2
	C) 3
	D) 4

ANSWERS :

1	A	**2**	C	**3**	D	**4**	D	**5**	B
6	C	**7**	D	**8**	A	**9**	D	**10**	D
11	D	**12**	D	**13**	D	**14**	C	**15**	B

ASSERTION AND REASONING TYPE QUESTIONS

1.	**Assertion (A)**	***If n (A) =p and n (B) = q then the number of relations from A to B is 2^{pq}.***
	Reason(R)	***A relation from A to B is a subset of A x B.***
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

2.	**Assertion (A)**	***If n (A) =m, then the number of reflexive relations on A is m***
	Reason(R)	***A relation R on the set A is reflexive if (a, a) $\in \boldsymbol{R}, \forall a \in$ A.***
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

3.	**Assertion (A)**	***Domain and Range of a relation*** $\boldsymbol{R = \{(x,y): x - 2y = 0\}\ defined\ on\ the\ set\ A = \{1,2,3,4\}\ are\ respectively\ \{1,2,3,4\} and\ \{2,4,6,8\}}$
	Reason(R)	***Domain and Range of a relation R are respectively the sets*** $\boldsymbol{\{a: a \in A\ and\ (a,b) \in R.\}\ and\ \{b: b \in A\ and\ (a,b) \in R\}}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

4.	**Assertion (A)**	**A relation R ={ (1,1),(1,2),(2,2),(2,3)(3,3)}defined on the set A={1,2,3} is reflexive.**
	Reason(R)	**A relation R on the set A is reflexive if (a,a)** $\in \boldsymbol{R}, \forall$ **a** $\in$ **A**
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

5.	**Assertion (A)**	A relation R ={ (1,1),(1,2),(2,2),(2,3)(3,3)}defined on the set A={1,2,3} is symmetric
	Reason(R)	A relation R on the set A is symmetric if (a,b) $\in R \Longrightarrow (b,a) \in R$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

6.	**Assertion (A)**	A relation R ={ (1,1),(1,3),(1.5),(3,1)(3,3),(3,5)}defined on the set A={1,3,5} is transitive.
	Reason(R)	A relation R on the set A symmetric if $(a,b) \in Rand\ (a,c) \in R \Longrightarrow (a,c) \in R)$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

7.	**Assertion (A)**	A relation R ={ (1,1),(1,3),(3,1)(3,3),(3,5)}defined on the set A={1,3,5} is reflexive.
	Reason(R)	A relation R on the set A is transitive if $(a, b) \in R\ and\ (b, c) \in R \Longrightarrow (a, c) \in R)$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

8.	**Assertion (A)**	The function f: R→R, f(x)=$\|x\|$ is not one-one
	Reason(R)	The function f(x)=$\|x\|$ is not onto .
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

9.	**Assertion (A)**	A={1,2,3},B={4,5,6,7} ,f={(1,4),(2,5),(3,6)} is a function from A to B.Then f is one-one
	Reason(R)	A function f is one –one if distinct elements of A have distinct images in B.
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

10.	**Assertion (A)**	Consider the function f:R⇢ R defined by $f(x)=\frac{x}{x^2+1}$ .Then f is one – one
	Reason(R)	f(4)=4/17 and f(1/4)=4/17
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

11.	**Assertion (A)**	Consider the function f: R⇢ R defined by $f(x) = x^3$. Then f is one-one
	Reason(R)	Every polynomial function is one-one
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

12.	**Assertion (A)**	n(A) =5, n(B) =5 and f : A→B is one-one then f is bijection
	Reason(R)	If n(A) = n(B) then every one-one function from A to B is onto
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

13.	**Assertion (A)**	The range of the function $\frac{x^2}{1+x^2}$ is [0, 1)
	Reason(R)	If f(x)≤g(x) then the range of $\frac{f(x)}{g(x)}$, g(x)≠ 0 is [0, 1)
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

14.	**Assertion (A)**	If X = { 0, 1, 2 } and the function $f: X \to Y$ defined by f(x) = x^2-2 is surjection then Y = { -2, -1, 0 }
	Reason(R)	***If*** *$f: X \to Y$ is surjective if f(X) = Y*
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

15.	**Assertion (A)**	A function f: A⇢ B, cannot be an onto function if n (A) <n (B).
	Reason(R)	A function f is onto if every element of co-domain has at least one pre-image in the domain
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

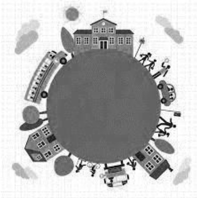
16.	**Assertion (A)**	A, B are two sets such that n(A)=p and n(B)=q, The number of functions from A onto B is q^p..
	Reason(R)	Every function is a relation
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

17.	**Assertion (A)**	A, B are two sets such that n(A)=m and n(B)=n. The number of one-one functions from A onto B is n_{p_m} ,if n≥ m .
	Reason(R)	A function f is one –one if distinct elements of A have distinct images in B
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

CASE STUDY TYPE QUESTIONS

CS– 1

Manikanta and Sharmila are studying in the same KendriyaVidyalaya in Visakhapatnam. The distance from Manikanta's house to the school is same as distance from Sharmila's house to the school. If the houses are taken as a set of points and KV is taken as origin, **then answer the below questions based on the given information**; (M for Manikanta's house and S for Sharmila's house)



i. The relation R is given by $R = \{\ (M, S)$:Distance of point M from origin is same as distance of point S from origin } is
   a) Reflexive, Symmetric and Transitive
   b) Reflexive, Symmetric and not Transitive
   c) Neither Reflexive nor Symmetric
   d) Not an equivalence relation

ii. Suppose Dheeraj's house is also at the same distance from KV then
   a) OM ≠ OS
   b) OM ≠ OD
   c) OS ≠ OD
   d) OM = OS= OD

iii. If the distance from Manikanta, Sharmila and Dheeraj houses from KV are same, then the points form a
   a) Rectangle
   b) Square
   c) Circle
   d) Triangle

iv. Let $R = \{(0,3), (0,0), (3,0)\}$, then the point which does not lie on the circle is
   a) (0,3)
   b) (0,0)
   c) (3,0)
   d) None of these

CS– 2

Priya and Surya are playing monopoly in their house during COVID. While rolling the dice their mother Chandrika noted the possible outcomes of the throw every time belongs to the set $\{1, 2, 3, 4, 5, 6\}$. Let A denote the set of players and B be the set of all possible outcomes.

Then $A = \{P, S\}$ $\quad B = \{1, 2, 3, 4, 5, 6\}$.**Then answer the below questions based on the given information**

i. Let $R: B \rightarrow B$ be defined by
$R = \{(a, b)\ both\ a\ and\ b\ are\ either\ odd\ or\ even\}$, then R is

a) Equivalence relation
b) Not Reflexive but symmetric, transitive
c) Reflexive, Symmetric and not transitive
d) Reflexive, transitive but not symmetric

ii. Chandrika wants to know the number of **functions**for$A$to B. How many number of **functions** are possible?

a) 6^2
b) 2^6
c) 6!
d) 2^{12}

iii. 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

a) Symmetric
b) Reflexive
c) Transitive
d) None of these

iv. 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

a) Symmetric
b) Reflexive and Transitive
c) Transitive and Symmetric
d) Equivalence Relation

v. Chandrika wants to know the number of **relations**for$A$to B. How many number of **relations** are possible?

a) 6^2
b) 2^6
c) 6!
d) 2^{12}

CS– 3

In two different societies, there are some school going students – including girls as well as boys. Satish forms two sets with these students, as his college project

Let $A = \{a_1, a_2, a_3, a_4, a_5\}$ and $B = \{b_1, b_2, b_3, b_4\}$ where $a_i's, b_i's$are the school going students of first and second society respectively.

Using the information given above, answer the following question

i. Satish wishes to know the number of reflexive relations defined on set A. How many such relations are possible?

a) 0
b) 2^5
c) 2^{10}
d) 2^{20}

ii. Let $R: A \to A, R = \{(x, y): x \text{ and } y \text{ are students of same sex}\}$. Then relation R is

a) Reflexive only
b) Reflexive and symmetric but not transitive
c) Reflexive and transitive but not symmetric
d) An equivalence relation

iii. Satish and his friend Rajat are interested to know the number of symmetric relations defined on both the sets A and B, separately. Satish decides to find the symmetric relation on set A, while Rajat decides to find symmetric relation on set B. What is difference between their results?

a) 1024
b) $2^{10}(15)$
c) $2^{10}(31)$
d) $2^{10}(63)$

iv. Let $R: A \to B, R = \{(a_1, b_1), (a_1, b_2), (a_2, b_1), (a_3, b_3), (a_4, b_2), (a_5, b_2)\}$, then R is

a) Neither one-one nor onto
b) One-one but not onto
c) Only onto but not one-one
d) One-one and onto both

v. To help Satish in his project, Rajat decides to form onto function from set A to itself. How many such functions are possible?

a) 342
b) 243
c) 729
d) 120

CS– 4

The maths teacher of class XII dictates amaths problem as follows.

' ' **Draw the graph of the function, f of x is equal to modulus of x plus three minus one in the closed interval -3 to +3**' '

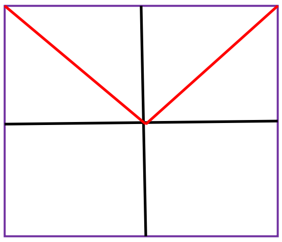
Three students **R**akesh, **S**ravya and **N**avyahaveinterpreted the same dictation in three different ways and they have noted the function as f(x)= |x +3-1|, f(x)=|x|+3-1 and f(x)=|x+3|-1 respectively. All three have drawn the graphs correctly for their respectivefunctions

.Based on the above information answer the following.

i. Sravya ' s graph in ' V shape ' with vertex

A) (-3, 1)
B) (3 , -1)
C) (0, 2)
D) (2, 0)

ii. observe the adjacent figure. This is the graph of

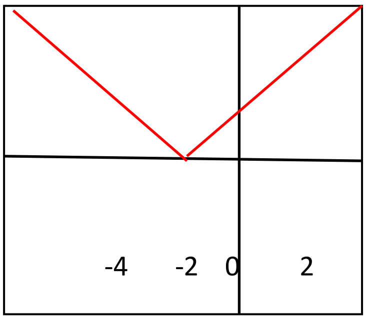


A) Rakhesh
B) Sravya
C) Navys
D) None of them

iii The distance between the vertices of the graphs of Rakesh and Navys graphs is

A) 1
B) $\sqrt{2}$
C) $\sqrt{3}$
D) 0

iv observe the adjacent figure. This is the graph of



A)Rakhesh

B)Sravya

C)Navys

D)None of them

v. The function $f(x) = \begin{cases} -x-4\,, & if\ x \le -3 \\ x+2\,, & if\ x > -3 \end{cases}$ is the another form of the function

A)Rakhesh

B)Sravya

C)Navys

D)None of them

Answers

ASSERTION AND REASONING

1	A	2	D	3	D	4	A	5	D
6	C	7	D	8	B	9	A	10	D
11	C	12	A	13	C	14	A	15	A
16	B	17	A						

CASE STUDY

CS-1	**I) A**	**II) D**	**III) C**	**iv) B**	
CS-2	**I) A**	**II) A**	**III) D**	**iv) B**	**V) D**
CS-3	**i) D**	**ii) D**	**iii) C**	**iv) A**	**v) D**
CS-4	**i) D**	**ii) D**	**iii) B**	**iv) A**	**v) C**

2.INVERSE TRIGONOMETRIC FUNCTIONS

Multiple choice questions -

1.	If $\alpha = \tan^{-1}\left(\tan\frac{5\pi}{4}\right)$ and $\beta = \tan^{-1}\left(-\tan\frac{2\pi}{3}\right)$ then	
	a) $4\alpha = 3\beta$	b) $3\alpha = 4\beta$
	c) $\alpha - \beta = \frac{7\pi}{12}$	d) None of these
2.	If $\tan^{-1}(1+x) + \tan^{-1}(1-x) = \frac{\pi}{2}$ then the value of x is ____	
	a) 0	b) -1
	c) 1	d) $\frac{1}{2}$
3.	The value of $\tan^{-1}2+\tan^{-1}3$ is :	
	a) $\frac{-\pi}{4}$	b) $\frac{\pi}{4}$
	c) $\frac{3\pi}{4}$	d) π
4.	The value of $\tan^{-1}x + \tan^{-1}3 = \tan^{-1}8$ then the value of x is :	
	$\frac{1}{3}$	c) 3
	b) 5	d) $\frac{1}{5}$
5.	The value of $\tan\left(\cos^{-1}\frac{4}{5} + \tan^{-1}\frac{2}{3}\right)$ is	
	a) $\frac{13}{6}$	b) $\frac{17}{6}$
	c) $\frac{19}{6}$	d) $\frac{23}{6}$
6.	If $\tan^{-1}(1-x)$, $\tan^{-1}x$ and $\tan^{-1}(1+x)$ are in AP , then the value of x^3+x^2 is:	

	a)0	b) 1
	c) -1	d) x – 1
7.	If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi$, then the value of x+y+z is	
	a) 0	b) $\frac{1}{2}$
	c) $\frac{\pi}{2}$	d) xyz
8.	If $\tan^{-1}\frac{a}{x} + \tan^{-1}\frac{b}{x} = \frac{\pi}{2}$, then the value of x is	
	a) ab	b) $\sqrt{ab}$
	c) $(ab)^2$	d) None of these
9.	If $\cos^{-1}x - \sin^{-1}x=0$, then the value of x is	
	a)0	b) 1
	c) $\frac{1}{\sqrt{2}}$	d) $\frac{\sqrt{3}}{2}$
10..	The value of $\cos^{-1}(\sin x) + \sin^{-1}(\cos x)$ is :	
	a) $\frac{\pi}{2}$	b) $\pi - x$
	c) $\pi - 2x$	d) $\frac{\pi}{2} - x$
11.	If $\sin^{-1}x + \sin^{-1}y = \frac{2\pi}{3}$, then the value of $\cos^{-1}x + \cos^{-1}y$ is :	
	a). $\frac{\pi}{6}$	b) $\frac{\pi}{3}$
	c) π	d) $\frac{\pi}{6}$
12.	$\tan^{-1}\frac{1}{11} + \tan^{-1}\frac{2}{11}$ is equal to :	
	a)0	b) $\frac{1}{2}$
	c) -1	d) None of these

13.	$\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$, then x is equal to :
	a) $\frac{1}{2}$ **b)** $\frac{\sqrt{3}}{2}$
	c) $-\frac{1}{2}$ **d)** $-\frac{\sqrt{3}}{2}$
14.	The value of $\cos^{-1}\left(\cos\frac{2\pi}{3}\right) + \sin^{-1}\left(\sin\frac{\pi}{3}\right)$ is
	a) π **b)** $\frac{\pi}{2}$
	c) $\frac{3\pi}{4}$ **d)** $\frac{4\pi}{3}$
15.	The value of $\tan\left(2\tan^{-1}\frac{1}{5} - \frac{\pi}{4}\right)$ is
	a) $\frac{7}{17}$ **b)** $-\frac{7}{17}$
	c) $\frac{7}{12}$ **d)** $-\frac{7}{12}$
16.	The value of $\cos\left[\tan^{-1}\frac{3}{4}\right]$ is
	a) $\frac{3}{5}$ b) $\frac{3}{5}$
	c) $\frac{4}{5}$ d) None of these
17.	If $\cot^{-1}\left(\frac{-1}{5}\right) = x$ and x is in second quadrant then the value of sinx is __
	a) $\frac{1}{\sqrt{26}}$ b) $\frac{5}{\sqrt{26}}$
	c) $\frac{-5}{\sqrt{26}}$ d) None of these

18.	The value of $\sin^{-1}\left(-\frac{1}{2}\right) + 2\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)$ is
	a) $\frac{\pi}{2}$ **b) -** $\frac{\pi}{2}$
	c) $\frac{3\pi}{2}$ **d) None of these**
19.	If $\tan^{-1} x = \frac{\pi}{4} - \tan^{-1}\frac{1}{3}$, then value of x is :
	a) $\frac{1}{2}$ **b)** $\frac{1}{4}$
	c) $\frac{1}{6}$ **d) None of these**
20.	**Find the value of** $\tan^{-1}\sqrt{3} - \sec^{-1}(-2) + \cos ec^{-1}\left(\frac{2}{\sqrt{3}}\right)$
	a) $\frac{\pi}{3}$ **b)** $\frac{-\pi}{3}$
	c) 0 **d)** $\frac{4\pi}{3}$
21.	**Find the value of** $\cos\left[\sin^{-1}\frac{1}{4} + \sec^{-1}\frac{4}{3}\right]$
	a) $\frac{3\sqrt{15} - \sqrt{7}}{6}$ **b)** $\frac{3\sqrt{15} + \sqrt{7}}{6}$
	c) $\frac{\sqrt{7} - 3\sqrt{15}}{16}$ **d)** $\frac{3\sqrt{15} - \sqrt{7}}{4}$
22.	**The value of** $\sin\left[\cot^{-1}\{\cos(\tan^{-1} 1)\}\right]$ **is**
	a) $\frac{2}{3}$ **b)** $\frac{\sqrt{2}}{\sqrt{3}}$
	c) $\frac{1}{\sqrt{2}}$ **d)** $\sqrt{\frac{3}{2}}$
23.	**Find the value of** $\sec^2\left[\tan^{-1}(2)\right] + \cos ec^2\left[\cot^{-1}(3)\right]$
	a) 5 **b) 10**
	c) 15 **d) 20**

24.	If $4\sin^{-1}x+\cos^{-1}x=\pi$, then find the value of x	
	a) $\frac{1}{2}$	b) $\frac{\sqrt{3}}{2}$
	c) $\frac{-1}{2}$	d) None of these
25.	If $\tan^{-1}x+2\cot^{-1}x=\frac{2\pi}{3}$, then find the value of x	
	a)3	b) $\sqrt{3}$
	c) $\frac{1}{\sqrt{3}}$	d) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$
26.	If $\tan^{-1}\left[\frac{1-x}{1+x}\right]=\frac{1}{2}\tan^{-1}x$, then find the value of x	
	a) $\frac{1}{2}$	b) $\sqrt{3}$
	c) $\frac{1}{\sqrt{3}}$	d)2
27.	If $\sin^{-1}\left[\frac{x}{5}\right]+\cos ec^{-1}\left[\frac{5}{4}\right]=\frac{\pi}{2}$, then find the value of x	
	a)4	b) 5
	c) 3	d) 1
28.	Which of the following corresponds to the principal value branch of $\tan^{-1}$?	
	(a) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$	(b) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$
	(c) $\left[0,\frac{\pi}{2}\right]$	(d) $(0,\pi)$
29.	Evaluate $\tan^{-1}\sqrt{3}-\sec^{-1}(-2)$	
	(a) $\frac{\pi}{4}$	(b) $\frac{\pi}{3}$

	c) $-\frac{\pi}{2}$	(d) $\frac{-\pi}{3}$
30.	If $\tan^{-1} x = \frac{\pi}{10}$ for some x∈ R , then the value of $\cot^{-1} x$ is	
	a) $\frac{\pi}{5}$	(b) $\frac{2\pi}{5}$
	(c) $\frac{3\pi}{5}$	d) $\frac{4\pi}{5}$

Solutions

Question No	Answer		Question No	Answer		Question No	Answer
1	a		11	B		21	a
2	a		12	D		22	b
3	c		13	B		23	c
4	d		14	A		24	a
5	b		15	B		25	b
6	b		16	C		26	c
7	d		17	B		27	c
8	b		18	C		28	a
9	c		19	A		29	d
10	c		20	C		30	b

ASSERTION AND REASONING TYPE QUESTIONS

1.	**Assertion (A)**	$\operatorname{cosec}^{-1}\left(\frac{1}{2}+\frac{1}{\sqrt{2}}\right) > \sec^{-1}\left(\frac{1}{2}+\frac{1}{\sqrt{2}}\right)$
	Reason(R)	$\operatorname{cosec}^{-1}(x) > \sec^{-1}(x)$ **if 1<x<** $\sqrt{2}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

2.	**Assertion (A)**	$\cos^{-1} x \geq \sin^{-1} x$, **for all** $x \in [-1,1]$
	Reason(R)	$\cos^{-1} x$ **is decreasing function in [-1,1]**
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

3.	**Assertion (A)**	**If** $0 < x \leq \frac{\pi}{2}$**, then** $\sin^{-1}(\cos x)+\cos^{-1}(\sin x) = \pi - 2x$
	Reason(R)	$\cos^{-1} x = \frac{\pi}{2} - \sin^{-1} x$ **for all** $x \in [-1,1]$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

4.	**Assertion (A)**	**1.** $\sin^{-1}\frac{8}{17} + \sin^{-1}\frac{3}{5} = \sin^{-1}\frac{77}{85}$
	Reason(R)	$\sin^{-1}x + \sin^{-1}y = \sin^{-1}\left(x\sqrt{1-y^2} + y\sqrt{1-x^2}\right)$ for $-1 \leq x, y \leq 1$, $x^2 + y^2 \leq 1$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

5.	**Assertion (A)**	$\cos^{-1}x = 2\sin^{-1}\sqrt{\frac{1-x}{2}} = 2\cos^{-1}\sqrt{\frac{1+x}{2}}$
	Reason(R)	$1 + \cos A = 2\cos^2\left(\frac{A}{2}\right)$ and $1 - \cos A = 2\sin^2\left(\frac{A}{2}\right)$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

6.	**Assertion (A)**	**If** $x = \frac{1}{5\sqrt{2}}$ **then** $\left\{x\cos(\cot^{-1}x) + \sin(\cot^{-1}x)\right\}^2 = \frac{51}{50}$
	Reason(R)	$\tan\left[\cos^{-1}\left(\frac{1}{5\sqrt{2}}\right) - \sin^{-1}\left(\frac{4}{\sqrt{17}}\right)\right] = \frac{29}{3}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
7.	**Assertion (A)**	$\tan^{-1}\left[x + \sqrt{1+x^2}\right] = \frac{\pi}{2} - \frac{1}{2}\cot^{-1}$

	Reason(R)	$\sin^2\left[2\tan^{-1}\sqrt{\frac{1+x}{1-x}}\right]=1-x^2$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

8.	**Assertion (A)**	$\tan^{-1}\left(\frac{2}{5}\right)+\tan^{-1}\left(\frac{3}{7}\right)=\frac{\pi}{4}$
	Reason(R)	$\tan^{-1}\left(\frac{x}{y}\right)+\tan^{-1}\left(\frac{y-x}{y+x}\right)=\frac{\pi}{4}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

9.	**Assertion (A)**	$\tan^{-1}\left(\frac{3}{4}\right)+\tan^{-1}\left(\frac{1}{7}\right)=\frac{\pi}{4}$
	Reason(R)	for x>0 , y>0 , xy<1 , $\tan^{-1}x+\tan^{-1}y=\tan^{-1}\left(\frac{x+y}{1-xy}\right)$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
10.	**Assertion (A)**	$\tan^{-1}x+\tan^{-1}\left(\frac{1}{x}\right)=\frac{\pi}{2}$

	Reason(R)	$\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$ **for all** $x \in R$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

11.	**Assertion (A)**	The value of $\cos^{-1} x + \cos^{-1}\left\{\frac{\pi}{2} + \frac{\sqrt{2-3x^2}}{2}\right\} = \frac{\pi}{3}$ when $\frac{1}{2} \le x \le 1$
	Reason(R)	**$\cos^{-1}x$** is increasing function for $0 \le x \le 1$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

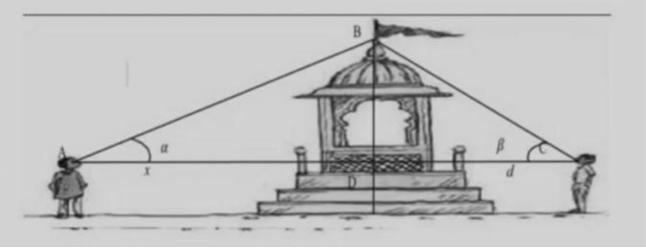
12.	**Assertion (A)**	The solution of $\sin^{-1}(6x) + \sin^{-1}(6\sqrt{3}x) = \frac{-\pi}{2}$ is $x = \frac{1}{12}$
	Reason(R)	$\sin^{-1} x$ is defined for $\lvert x \rvert \le 1$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
13.	**Assertion (A)**	$\cos^{-1} x - \sin^{-1} x = 0$, then x= $\frac{1}{\sqrt{2}}$

	Reason(R)	$\cos^{-1} x + \sin^{-1} x = \frac{\pi}{2}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

14.	**Assertion (A)**	$\cot\left[\frac{\pi}{2} - 2\cot^{-1} 3\right] = 7$
	Reason(R)	$\sin^{-1}\left(\frac{4}{5}\right) + 2\tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{2}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

CASE STUDY TYPE QUESTIONS

CS – 1



Two men on either side of a temple of 30 meters high observe its top at the angles of elevation α and β respectively. (as shown in the figure above). The distance between the two men is $40\sqrt{3}$ meters and the distance between the first person A and the temple is $30\sqrt{3}$ meters. Based on the above information answer the following.

1. $\angle CAB = \alpha =$

   (A) $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$

   (B) $\sin^{-1}\left(\frac{1}{2}\right)$

   (C) $\sin^{-1}(2)$

   (D) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

2. $\angle CAB = \alpha =$

   (A) $\cos^{-1}\left(\frac{1}{5}\right)$

   (B) $\cos^{-1}\left(\frac{2}{5}\right)$

   (C) $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

   (D) $\cos^{-1}\left(\frac{4}{5}\right)$

3. $\angle BCA = \beta =$

   (A) $\tan^{-1}\left(\frac{1}{2}\right)$

   (B) $\tan^{-1}(2)$

   (C) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

   (D) $\tan^{-1}(\sqrt{3})$

4. $\angle ABC =$

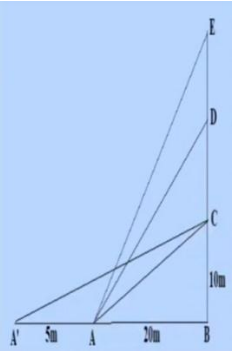
   (A) $\frac{\pi}{4}$

   (B) $\frac{\pi}{6}$

   (C) $\frac{\pi}{2}$

   (D) $\frac{\pi}{3}$

CS– 2



The Government of India is planning to fix a hoarding board at the face of the 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 the project. "A" is considered to be a person viewing the hoarding board 20 meters away from the building, standing at the edge of a pathway nearby. Ram, Robert and Rahim suggested to the firm to place the hoarding board at three different locations namely C, D and E. "C" is at the height of 10 meters 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 the 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.

1. The measure of $\angle CAB$
   (A) $\tan^{-1}(2)$
   (B) $\tan^{-1}\left(\frac{1}{2}\right)$
   (C) $\tan^{-1}(1)$
   (D) $\tan^{-1}(3)$
2. The measure of $\angle DAB$
   (A) $\tan^{-1}\left(\frac{3}{4}\right)$
   (B) $\tan^{-1}(3)$
   (C) $\tan^{-1}\left(\frac{4}{3}\right)$
   (D) $\tan^{-1}(4)$
3. The measure o $\angle EAB$
(A) $\tan^{-1}(11)$
(B) $\tan^{-1}(3)$
(C) $\tan^{-1}\left(\frac{2}{11}\right)$
(D) $\tan^{-1}\left(\frac{11}{2}\right)$

4 .$A^{|}$is the 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 $\angle CA^{|}B$ and$\angle CPB$

(A) $\tan^{-1}\left(\frac{1}{12}\right)$

(B) $\tan^{-1}\left(\frac{1}{8}\right)$

(C) $\tan^{-1}\left(\frac{2}{5}\right)$

(D) $\tan^{-1}\left(\frac{11}{21}\right)$

Answers

ASSERTION AND REASONING

1	A	2	D	3	A	4	A	5	A
6	B	7	B	8	A	9	A	10	A
11	C	12	D	13	A	14	B		

CASE STUDY

CS-1	**I)B**	**II) C**	**III) D**	**iv)C**	
CS-2	**I)B**	**II) C**	**III) D**	**iv) A**	**V)**

Hints for selected questions :

3.statement 1 : $\sin^{-1}$(cosx)+$\cos^{-1}$(sinx) = $\frac{\pi}{2} - \cos^{-1}(\cos x) + \frac{\pi}{2} - \sin^{-1}(\sin x)$

$$= \pi - 2x$$

5.put x = $\cos\theta$ to prove statement 1

7. Put $x = \cot\theta$ **in statement 1 and .put x = $\cos\theta$ in statement 2**

11. put x = $\cos\theta$ to prove statement 1

12. $\sin^{-1}x + \sin^{-1}y = \sin^{-1}\left(x\sqrt{1-y^2} + y\sqrt{1-x^2}\right)$

3.Matrices

Q1.	If a matrix has 8 elements then the total number of different orders of writing the matrices.	
	A) 1	B)2
	C)3	D)4
Q2.	Let A and B are two matrices and A+B and AB both exist, then	
	A)A and B are square matrices.	B)A and B are mXn matrices.
	C) A and B are square matrices of same order.	D)None of these.
Q3.	The number of all possible matrices of order 3x3 with each entry 1 or 2 is	
	A) 27	B)18
	C)81	D)512
Q4.	If $A = (a_{ij})_{mxn}$ $is\ a\ scalar\ matrix, if$	
	A)$a_{ij} = 0, for\ all\ i \neq j.$	B)$a_{ij} = constant, for\ all\ i = j\ and\ a_{ij} = 0, for\ all\ i \neq j.$
	C)$a_{ij} = 0, for\ all\ i = j.$	D)$a_{ij} = constant, for\ all\ i = j\ and\ a_{ij} = 0, for\ some\ i \neq j.$
Q5.	If $A = (a_{ij})_{mxn}$ $with\ a_{ij} = \frac{(i-j)^2}{2}$ $, then\ A =$	
	A)$\begin{pmatrix} 0 & \frac{1}{2} \\ \frac{1}{2} & 0 \end{pmatrix}$	B)$\begin{pmatrix} 0 & -\frac{1}{2} \\ -\frac{1}{2} & 0 \end{pmatrix}$
	C)$\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$	D)$\begin{pmatrix} -\frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \end{pmatrix}$
Q6.	$If\ A\ and\ B\ are\ matrices\ with\ AB = O\ and\ BA = O, then$	
	A) A=O or B=O	B) Either A=O or B=O
	C) A=O and B=O	D) None of these.
Q7.	$If\ A\ and\ B\ are\ matrices\ with\ AB = O\ , then$	
	A) A=O or B=O	B) Either A=O or B=O
	C) A=O and B=O	D) None of these.
Q8.	From the following, Identify the wrong statement.	
	A) Matrix multiplication satisfies associative property.	B) Matrix multiplication is distributive over addition.
	C) Matrix multiplication satisfies commutative property.	D) For every non-singular square matrix, inverse exists.
Q9.	If $A(x) = \begin{pmatrix} cosx & -sinx & 0 \\ sinx & cosx & 0 \\ 0 & 0 & 1 \end{pmatrix}$, then $A(x).A(y) =$	

	A) A(x.y)	B) A(x+y)
	C) A(x-y)	D) None of these.
Q10.	$(AB)'$=	
	A)$A'B'$	B)$B'A'$
	C)$(BA)'$	D) None of these
Q11.	Let A be a square matrix and it is expressed as the sum of symmetric and skew symmetric matrices. Then symmetric part of A is	
	A)$\frac{1}{2}(A+A^T)$	B)$(A+A^T)$
	C)$\frac{1}{2}(A-A^T)$	D)$\frac{1}{2}(A^T-A)$
Q12.	Let A be a square matrix and it is expressed as the sum of symmetric and skew symmetric matrices. Then skew-symmetric part of A is	
	A) $\frac{1}{2}(A+A^T)$	B)$(A+A^T)$
	C)$\frac{1}{2}(A-A^T)$	D)$\frac{1}{2}(A^T-A)$
Q13.	If A and B are symmetric matrices of same order, then AB - BA is a	
	A) Skew Symmetric matrix	B) Zero matrix
	C) Identity matrix	D) Symmetric matrix
Q14.	If $A=\begin{pmatrix} cosx & -sinx \\ sinx & cosx \end{pmatrix}$ $, and\ A+A^T=I, then\ the\ value\ of\ x\ is$	
	A)$\frac{\pi}{6}$	B)$\frac{\pi}{3}$
	C)$\frac{3\pi}{2}$	D)π
Q15.	The principal diagonal elements of a skew symmetric matrix are	
	A) 1	B) 0
	C) 0 or 1	D) None of these
Q16.	If $A=\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then what is $AA^T(\ where\ A^T is\ the\ transpose\ of\ A)$?	
	A) O	B) I
	C) 2I	D) 3I
Q17.	If $\mathrm{AB}=\mathrm{C}$, where $A=\begin{pmatrix} x+y & y \\ x & x-y \end{pmatrix}, B=\begin{pmatrix} 3 \\ -2 \end{pmatrix}\ and\ C=\begin{pmatrix} 4 \\ -2 \end{pmatrix}$, then what is A^2 equal to?	
	A) $\begin{pmatrix} 4 & 8 \\ -4 & -16 \end{pmatrix}$	B)$\begin{pmatrix} 4 & -4 \\ 8 & -16 \end{pmatrix}$
	C)$\begin{pmatrix} -4 & -8 \\ 4 & 12 \end{pmatrix}$	D)$\begin{pmatrix} -4 & -8 \\ 8 & 12 \end{pmatrix}$
Q18.	If $A=\begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$, then $A^3=$	
	A)$\begin{pmatrix} \cos 3\theta & \sin 3\theta \\ -\sin 3\theta & \cos 3\theta \end{pmatrix}$	B)$\begin{pmatrix} \cos^3\theta & \sin^3\theta \\ -\sin^3\theta & \cos^3\theta \end{pmatrix}$
	C)$\begin{pmatrix} \cos 3\theta & -\sin 3\theta \\ \sin 3\theta & \cos 3\theta \end{pmatrix}$	D)$\begin{pmatrix} \cos^3\theta & -\sin^3\theta \\ \sin^3\theta & \cos^3\theta \end{pmatrix}$

Q19.	What is the order of $\begin{pmatrix} x & y & z \end{pmatrix}\begin{pmatrix} a & h & g \\ h & b & f \\ g & f & c \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix}$	
	A) 3x1	B)1x1
	C)1x3	D)3x3
Q20.	If $A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$, then the value of A^4 is	
	A)$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	B)$\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$
	C)$\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$	D)$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
Q21.	The number of all possible matrices of order 3 × 3 with each entry 0 or 1 is:	
	A) 27	B)81
	C) 18	D)512
Q22.	If $A = (a_{ij})_{mxn}$ $is\ a\ square\ matrix, then$	
	A) m<n	B) m>n
	C) m=n	D) None of these
Q23.	Which of the given values of x and y make the following pair of matrices, equal. $\begin{pmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{pmatrix}, \begin{pmatrix} 5 & y-2 \\ 8 & 4 \end{pmatrix}$	
	A)$x = -\frac{1}{3}, y = 7$	B)$y = 7, x = -\frac{2}{3}$
	C)$x = -\frac{1}{3}$ $, y = -\frac{2}{3}$	D) Not possible to find.
Q24.	Let X, Y, Z, W and P are matrices of order 2 × n, 3 × k, 2 × p, n × 3 and p × k, respectively. The restriction on n, k and p so that PY + WY will be defined are	
	A) k = 3, p = n	B) k is arbitrary, p = 2
	C) p is arbitrary, k = 3	D) k = 2, p = 3
Q25.	Let X, Y, Z, W and P are matrices of order 2 × n, 3 × k, 2 × p, n × 3 and p × k, respectively. If n = p, then the order of the matrix 7X – 5Z is	
	A) p × 2	B) 2 × n
	C) n × 3	D) p × n
Q26.	If A and B are square matrices of the same order, then (A + B) (A – B) is equal to	
	A)$A^2 - B^2$	B)$A^2 - BA - AB - B^2$
	C)$A^2 - B^2 + BA - AB$	D)$A^2 - BA + B^2 + AB$
Q27.	If $A = \begin{pmatrix} 2 & -1 & 3 \\ -4 & 5 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 3 \\ 4 & 2 \\ 1 & 5 \end{pmatrix}$, $then$	
	A) Only AB is defined	B) Only BA is defined
	C) AB and BA both are defined	D) AB and BA both are not defined.

Q28.	The matrix $A = \begin{pmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{pmatrix}$ is	
	A) Scalar matrix	B) Diagonal matrix
	C) unit matrix	D) Square matrix
Q29.	If A and B are symmetric matrices of same order, then $(AB' - BA')\ is\ a$	
	A) Skew symmetric matrix	B) Null matrix
	C) Symmetric matrix	D) None of these
Q30.	If A=$\frac{1}{\pi}\begin{pmatrix} \sin^{-1}(x\pi) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & \cot^{-1}(\pi x) \end{pmatrix}$, $B = \frac{1}{\pi}\begin{pmatrix} -\cos^{-1}(x\pi) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & -\tan^{-1}(\pi x) \end{pmatrix}$,then A-B is equal to	
	A) I	B) O
	C) 2I	D)$\frac{1}{2}I$
Q31.	If A and B are two matrices of the order 3 × m and 3 × n, respectively, and m = n, then the order of matrix (5A – 2B) is	
	A) m × 3	B)3X3
	C) m × n	D)3Xn
Q32.	The matrix $\begin{pmatrix} 0 & -5 & 8 \\ 5 & 0 & 12 \\ -8 & -12 & 0 \end{pmatrix}$ is a	
	A) diagonal matrix	B) symmetric matrix
	C) skew symmetric matrix	D) scalar matrix
Q33.	If A is matrix of order m × n and B is a matrix such that AB' and B'A are both defined, then order of matrix B is	
	A) m × m	B) n × n
	C) n × m	D) m × n
Q34.	If A and B are matrices of same order, then (AB'–BA') is a	
	A) skew symmetric matrix	B) null matrix
	C) symmetric matrix	D) unit matrix
Q35.	If A is a square matrix such that $A^2 = I, then\ (A - I)^3 + (A + I)^3 - 7A$ is equal to	
	A) A	B) I-A
	C) I+A	D) 3A
Q36.	For any two matrices A and B, we have	
	A) AB = BA	B) AB ≠ BA

	C) AB = O	D) None of the above
Q37.	If $A = \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix}, then\ the\ expression\ A^3 - 2A^2\ is$	
	A) Null matrix	B) Identity matrix
	C) A	D) -A
Q38.	If A is a 2 × 3 matrix and AB is a 2 × 5 matrix, then B must be a	
	A) 3 × 5 matrix	B) 5 × 3 matrix
	C) 3 × 2 matrix	D) 5 × 2 matrix
Q39.	If $A = \begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}\ and\ A^2 - kA - I = O, where\ I\ is\ the\ identity\ matrix\ of\ order\ 2X2, then\ what\ is\ the\ value\ of\ k?$	
	A) 4	B)-4
	C) 8	D) -8
Q40.	If α and β are the roots of the equation $1 + x + x^2$ = 0, then the $\begin{pmatrix} 1 & \beta \\ \alpha & \alpha \end{pmatrix}\begin{pmatrix} \alpha & \beta \\ 1 & \beta \end{pmatrix}$is equal to	
	A) $\begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix}$	B)$\begin{pmatrix} -1 & -1 \\ -1 & 2 \end{pmatrix}$
	C) $\begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}$	D)$\begin{pmatrix} -1 & -1 \\ -1 & -2 \end{pmatrix}$
Q41.	Consider the following in respect of the matrix $A = \begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}$ 1. $A^2 = -A$ 2. $A^3 = 4A$ Which of the above is/are correct?	
	A) 1 only	B) 2 only
	C) Both 1 and 2	D) Neither 1 nor 2
Q42.	If $A = \begin{pmatrix} 1 & 0 & -2 \\ 2 & -3 & 4 \end{pmatrix}, then\ the\ matrix\ X\ for\ which\ 2X + 3A = O\ holds\ true\ is$	
	A) $\begin{pmatrix} -\frac{3}{2} & 0 & -3 \\ -3 & -\frac{3}{2} & -6 \end{pmatrix}$	B)$\begin{pmatrix} \frac{3}{2} & 0 & -3 \\ 3 & -\frac{9}{2} & -6 \end{pmatrix}$
	C) $\begin{pmatrix} \frac{3}{2} & 0 & 3 \\ 3 & \frac{9}{2} & 6 \end{pmatrix}$	D)$\begin{pmatrix} -\frac{3}{2} & 0 & 3 \\ -3 & \frac{9}{2} & -6 \end{pmatrix}$
Q43.	If $(5\ x\ 1)\begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix} = (20), then\ the\ value\ of\ x\ is$	
	A) 7	B)-7

	C) $\frac{1}{7}$	D) 0
Q44.	A is of order m x n and B is of order p x q, addition of A and B is possible only if	
	A) m=p	B) n = q
	C) n = p	D) m = p, n = q
Q45.	If $A = \begin{pmatrix} \alpha & \beta \\ \gamma & -\alpha \end{pmatrix}$ 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) $1 + \alpha^2 - \beta\gamma = 0$
Q46.	Which one of the following statements is not true?	
	A) A scalar matrix is a square matrix	B) A diagonal matrix is a square matrix
	C) A scalar matrix is a diagonal matrix	D) A diagonal matrix is a scalar matrix
Q47.	If A is of order 3 x 4 and B is of order 4 x 3, then the order of BA is	
	A) 3x3	B)4x4
	C) 4x3	D) not defined
Q48.	A is order m x n and B is order p x q, AB exist only if	
	A) m = p	B) n = q
	C) n = p	D) m = p, n = q
Q49.	Which one of the following is true for any two square matrices A and B of same order?	
	A) $(AB)^T = A^T B^T$	B)$(A^T B)^T = A^T B^T$
	C) $(AB)^T = BA$	D)$(AB)^T = B^T A^T$
Q50.	If $A = \begin{pmatrix} 4 & -2 \\ 6 & -3 \end{pmatrix}$, $then\ A^2\ is$	
	A) $\begin{pmatrix} 16 & 4 \\ 36 & 9 \end{pmatrix}$	B)$\begin{pmatrix} 8 & -4 \\ 12 & -6 \end{pmatrix}$
	C) $\begin{pmatrix} 4 & -2 \\ -6 & 3 \end{pmatrix}$	D)$\begin{pmatrix} 4 & -2 \\ 6 & -3 \end{pmatrix}$

Answers

1.D	2.C	3.D	4.B	5.A	6.D	7.D	8.C	9.B	10.B
11.A	12.C	13.A	14.B	15.B	16.B	17.D	18.A	19.B	20.A
21.D	22.C	23.B	24.A	25.B	26.C	27.C	28.D	29.A	30.D
31.D	32.C	33.D	34.A	35.A	36.B	37.A	38.A	39.A	40.B
41.B	42.D	43.B	44.D	45.C	46.D	47.B	48.C	49.D	50.D

ASSERTION AND REASONING TYPE QUESTIONS

1.	**Assertion (A)**	If $A = \begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 4 \\ 0 & 5 \end{pmatrix}$. $(A + B)^2 = A^2 + 2AB + B^2$
	Reason(R)	$AB \neq BA$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

2.	**Assertion (A)**	If $A = \begin{pmatrix} 1 & 2 & -1 \\ 2 & 0 & 3 \\ -1 & 3 & 4 \end{pmatrix}$, then A^{-1} is symmetric matrix.
	Reason(R)	If A is symmetric matrix then A^{-1} is symmetric matrix
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

3.	**Assertion (A)**	if $A = \begin{pmatrix} 0 & 2 & -1 \\ -2 & 0 & 3 \\ 1 & -3 & 0 \end{pmatrix}$ then, A^{-1} is skew symmetric matrix.
	Reason(R)	If A is skew symmetric matrix then A^{-1} is skew symmetric matrix.
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

4.	**Assertion (A)**	Let A and B are 2x2 matrices. $AB = I_2 \Rightarrow A = B^{-1}$.
	Reason(R)	$AB = O \implies A = O$ or $B = O$.

A Both A and R are true and R is the correct explanation of A

B Both A and R are true but R is NOT the correct explanation of A.

C A is true but R is false

D A is false but R is true

E Both A and R are false

5.	**Assertion (A)**	Matrix $A = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix}$, satisfies the equation $X^2 - 2X + 5I = \mathbf{O}$, then A is invertible.
	Reason(R)	If a square matrix satisfies the equation $a_n X^n + a_{n-1} X^{n-1} + \cdots + a_1 X + a_n I_2 = \mathbf{O}$ and $a_n \neq 0$, Then A is invertible

A Both A and R are true and R is the correct explanation of A

B Both A and R are true but R is NOT the correct explanation of A.

C A is true but R is false

D A is false but R is true

E Both A and R are false

6.	**Assertion (A)**	If $A = \begin{pmatrix} 3 & -2 & 10 \\ -2 & 4 & 5 \\ 10 & 5 & 6 \end{pmatrix}$ and $X=\begin{pmatrix} 1 & 5 & 6 \\ -2 & 0 & 1 \\ 4 & 3 & 2 \end{pmatrix}$ $X'AX$ is symmetric matrix.
	Reason(R)	$X'AX$ is symmetric or skew symmetric as A is symmetric or skew symmetric

A Both A and R are true and R is the correct explanation of A

B Both A and R are true but R is NOT the correct explanation of A.

C A is true but R is false

D A is false but R is true

E Both A and R are false

7.	**Assertion (A)**	If $A = \begin{pmatrix} -3 & 2 \\ -5 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & -2 \\ 5 & -3 \end{pmatrix}$.then$A^{100}B = BA^{100}$.
	Reason(R)	If $AB = BA \Rightarrow A^nB = BA^n$ for all positive integers n
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

8.	**Assertion (A)**	: If $A = \begin{pmatrix} 0 & -2 & 3 \\ 2 & 0 & 6 \\ -3 & -6 & 0 \end{pmatrix}$, then A^{-1} does not exist.
	Reason(R)	: If A is a skew symmetric matrix of odd order, then A is singular
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

9.	**Assertion (A)**	If A is a square matrix such that $A^2 = I$, then $(I + A)^2 - 3A = I$.
	Reason(R)	$AI = IA = A$, wehre I is Idetity matrix
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

10.	Assertion (A)	$(A+B)^2 \neq A^2 + 2AB + B^2$
	Reason(R)	Generally AB=BA
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

11.	Assertion (A)	If the matrix $P = \begin{pmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & 3 \end{pmatrix}$ is a symmetric matrix, then $a = -\frac{2}{3}$ and $b = \frac{3}{2}$
	Reason(R)	If P is a symmetric matrix, then $P' = P$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

12.	Assertion (A)	Let $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $X = \begin{pmatrix} x \\ y \end{pmatrix}$. If $X'AX = \mathbf{O}$ for each X , then A must be skew symmetric matrix
	Reason(R)	If A is symmetric matrix and $X'AX = \mathbf{O}$ for each X, then A=**O.**
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
13.	Assertion (A)	Let $A_\theta = \begin{pmatrix} \cos\theta + \sin\theta & \sqrt{2}\sin\theta \\ -\sqrt{2}\sin\theta & \cos\theta - \sin\theta \end{pmatrix} \left(A_{\frac{\pi}{3}}\right)^3 = -I.$
	Reason(R)	: $A_\theta . A_\varphi = A_{\theta+\varphi}$

A	Both A and R are true and R is the correct explanation of A
B	Both A and R are true but R is NOT the correct explanation of A.
C	A is true but R is false
D	A is false but R is true
E	Both A and R are false

14.	**Assertion (A)**	If $A = \begin{pmatrix} 1 & \pi \\ 0 & 1 \end{pmatrix}$, then $A^{100} = \begin{pmatrix} 1 & 100\pi \\ 0 & 1 \end{pmatrix}$.
	Reason(R)	If B is matrix of order 2X2 and $B^2 = \mathbf{O}$, then $(I + B)^n = I + nB$, for all $n \in N$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

15.	**Assertion (A)**	Suppose $X = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ satisfies $X^2 - 4X + 3I = \mathbf{O}$.: If $a + d \neq 4$, then there are just two matrices such X.
	Reason(R)	There are infinitely many matrices X satisfies the equation $X^2 - 4X + 3I = \mathbf{O}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

CASE STUDY TYPE QUESTIONS

CS– 1

Two farmers Ravi and Ramu cultivate only three varieties of pulses namely Urad, Massor and Mung. The sale (in Rs.) of these varieties of pulses by both the farmers in the month of September and October are given by the following matrices A and B.

September sales (in Rs.):

$$A = \begin{array}{c} \\ \end{array}\begin{array}{ccc} \text{Urad} & \text{Masoor} & \text{Mung} \end{array}$$
$$A = \begin{pmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{pmatrix} \begin{matrix} \text{Ravi} \\ \text{Ramu} \end{matrix}$$

October sales (in □):

$$\begin{array}{ccc} \text{Urad} & \text{Masoor} & \text{Mung} \end{array}$$
$$A = \begin{pmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{pmatrix} \begin{matrix} \text{Ravi} \\ \text{Ramu} \end{matrix}$$

Using Algebra of matrices, answer the following questions.

i. The combined sales of Masoor in September and October, for farmer Ramu is

(A) Rs.80000 (B) Rs.90000 (C) Rs.40000 (D) Rs.135000

ii. The combined sales of Urad in September and October, for farmer Ravi is

(A) Rs.20000 (B) Rs.30000 (C) Rs.36000 (D) Rs.15000

iii. Find decrease in sales of Mung from September to October, for the farmer Ravi.

(A) Rs.24000 (B) Rs.10000 (C) Rs.30000 (D) No Change

iv. If both the farmers receive 2% profit on gross sales, then compute the profit for each farmer and for each variety sold in October

(A)
$$\begin{array}{ccc} \text{Urad} & \text{Masoor} & \text{Mung} \end{array}$$
$$\begin{pmatrix} 100 & 200 & 220 \\ 400 & 300 & 200 \end{pmatrix} \begin{matrix} \text{Ravi} \\ \text{Ramu} \end{matrix}$$

(B) $\begin{matrix} & \text{Urad} & \text{Masoor} & \text{Mung} & \\ & \begin{pmatrix} 100 & 200 & 120 \\ 400 & 200 & 200 \end{pmatrix} & & & \begin{matrix}\text{Ravi} \\ \text{Ramu}\end{matrix} \end{matrix}$

(C) $\begin{matrix} & \text{Urad} & \text{Masoor} & \text{Mung} & \\ & \begin{pmatrix} 150 & 200 & 220 \\ 400 & 200 & 280 \end{pmatrix} & & & \begin{matrix}\text{Ravi} \\ \text{Ramu}\end{matrix} \end{matrix}$

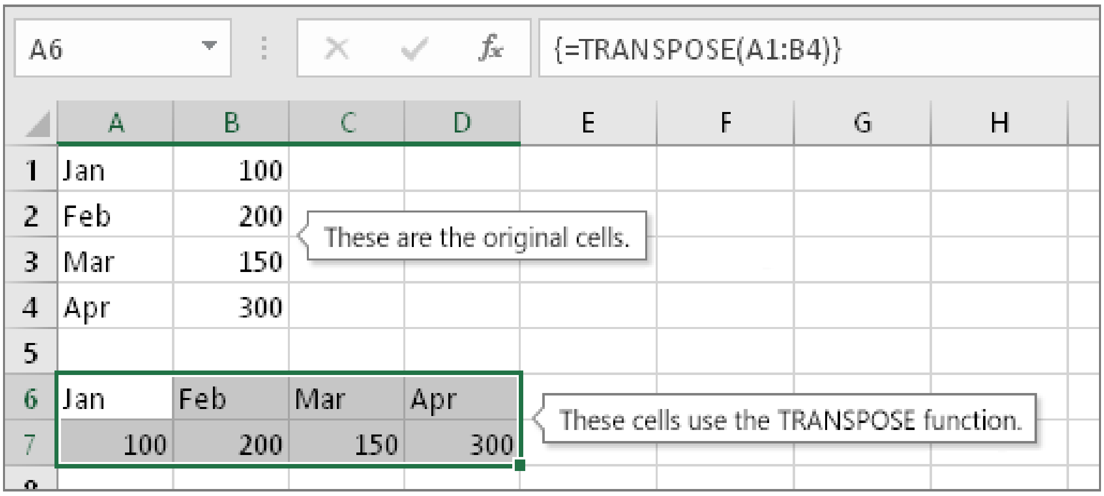
(D) $\begin{matrix} & \text{Urad} & \text{Masoor} & \text{Mung} & \\ & \begin{pmatrix} 100 & 200 & 120 \\ 250 & 200 & 220 \end{pmatrix} & & & \begin{matrix}\text{Ravi} \\ \text{Ramu}\end{matrix} \end{matrix}$

v. Which variety of pulses has the highest selling value in the month of September for the farmerRamu?

(A) Urad (B) Masoor (C) Mung (D) All of these have same price

CS– 2

While working with excel, we need to switch or rotate cells. You can do this by copying, pasting, and using the Transpose option. But doing that creates duplicated data. If you don't want that, you can type a formula instead using the TRANSPOSE function. For example, in the following picture the formula **=TRANSPOSE(A1:B4)** takes the cells A1 through B4 and arranges them horizontally.



i. A square matrix A is expressed as sum of symmetric and skew symmetric matrices, and then symmetric part of A is

(A) $\frac{1}{2}(A + A^T)$ (B) $\frac{1}{2}(A - A^T)$ (C) $\frac{1}{2}(A^T - A)$ (D) None of them

ii. A square matrix A is expressed as sum of symmetric and skew symmetric matrices, and then skew-symmetric part of A is

(A) $\frac{1}{2}(A + A^T)$ (B) $\frac{1}{2}(A - A^T)$ (C) $\frac{1}{2}(A^T - A)$ (D) None of them

iii. Symmetric part of $A=\begin{pmatrix} 1 & 2 & 5 \\ 3 & 2 & 1 \\ 4 & 5 & 7 \end{pmatrix}$

(A) $\begin{pmatrix} 1 & \frac{5}{2} & \frac{9}{2} \\ \frac{5}{2} & 2 & 3 \\ \frac{9}{2} & 3 & 7 \end{pmatrix}$ (B) $\begin{pmatrix} 1 & -\frac{5}{2} & -\frac{9}{2} \\ -\frac{5}{2} & 2 & 3 \\ -\frac{9}{2} & -3 & 7 \end{pmatrix}$ (C) $\begin{pmatrix} 0 & \frac{5}{2} & \frac{9}{2} \\ \frac{5}{2} & 0 & 3 \\ \frac{9}{2} & 3 & 0 \end{pmatrix}$ (D) $\begin{pmatrix} 0 & -\frac{5}{2} & -\frac{9}{2} \\ -\frac{5}{2} & 0 & 3 \\ -\frac{9}{2} & -3 & 0 \end{pmatrix}$

iv. Skew- Symmetric part of A= $\begin{pmatrix} 1 & 2 & 5 \\ 3 & 2 & 1 \\ 4 & 5 & 7 \end{pmatrix}$

(A) $\begin{pmatrix} 0 & -\frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 0 & -2 \\ -\frac{1}{2} & 2 & 0 \end{pmatrix}$ (B) $\begin{pmatrix} 0 & \frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & 0 & -2 \\ \frac{1}{2} & 2 & 0 \end{pmatrix}$ (C) $\begin{pmatrix} 0 & \frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & 0 & 2 \\ \frac{1}{2} & -2 & 0 \end{pmatrix}$ (D) $\begin{pmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 0 & 2 \\ \frac{1}{2} & -2 & 0 \end{pmatrix}$

v. When writing Square matrix A as sum of symmetric and skew-symmetric matrices, is symmetric and skew symmetric matrices are unique?

(A) Yes (B) No

CS– 3
.

The monthly incomes of two brother Rakesh and Rajesh are in the ratio 3:4 and the monthly expenditures are in the ratio 5:7.Each brother saves □ 15,000 per month.

Read the above instruction and answer the following questions.

(i) If monthly income of Rakesh and Rajesh are □ 3x and □4x and their expenditure are □5y and □7y respectively, then identify the system of linear equations for the above problem.

(A) $x - y = 15000;\ x + y = 15000$

(B) $3x + 5y = 15000;\ \ 4x + 7y = 15000$

(C) $3x - 5y = 15000;\ 4x - 7y = 15000$

(D) $5x - 3y = 15000;\ x - 4y = 15000$

(ii) Identify the matrix equation for question (i).

(A) $AX = B$, where $A = \begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}, X = \begin{pmatrix} x \\ y \end{pmatrix}, B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$

(B) $BX = A$, where $A = \begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}, X = \begin{pmatrix} x \\ y \end{pmatrix}, B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$

(C) $AB = I$, where $A = \begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$, $B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$

(D) $AB = X$, where $A = \begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$, $B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$

(iii) If $AX = B$, where A, X, B matrices then X should be

(A) $X = AB$ (B) $X = A^{-1}B$ (C) $X = AB^{-1}$ (D) $X = BA$

(iv) If $A = \begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, then A^{-1} is

(A) $\begin{pmatrix} 7 & 5 \\ 4 & 3 \end{pmatrix}$ (B) $\begin{pmatrix} -7 & 5 \\ -4 & 3 \end{pmatrix}$ (C) $\begin{pmatrix} -7 & 5 \\ 4 & -3 \end{pmatrix}$ (D) $\begin{pmatrix} 7 & -5 \\ 4 & -3 \end{pmatrix}$

(v) Monthly incomes of Rakesh and Rajesh respectively are

(A) □ 90,000 each

(B) (B) □90,000, □12,000

(C) □ 1,20,000 , □ 90,000

(D) None of these

CS– 4

On the occasion of children's day class teacher of class XII Sh. Vinod Kumar, decided to distribute some chocolates to students of class XII. If there were 8 students less everyone would have got 10 chocolates more compared to original number of chocolates received. However, if there were 16 students more, everyone would have got 10 chocolates less compared to original number of chocolates received.

Based on the above information answer the following.

(i) If number of students in class be 'x' and Sh. Vinod Kumar has decided to distribute 'y' chocolates to each student, then identify the system of linear equations for the given problem.

(A) $5x + 4y = 40;\ 5x - 8y = 50$ (B) $x - y = 40;\ 2x - 3y = 80$

(C) $5x - 4y = 40; 5x - 8y = -80$ (D) $8x + 10y = 40;\ 16x - 10y = 80$

(ii) Identify the matrix equation for given problem.

(A) $\begin{pmatrix} 5 & 4 \\ 5 & -8 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ 50 \end{pmatrix}$ (B) $\begin{pmatrix} 1 & -1 \\ 2 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ -80 \end{pmatrix}$

	(C) $\begin{pmatrix}5 & -4\\5 & -8\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}40\\-80\end{pmatrix}$ (D) $\begin{pmatrix}8 & 10\\16 & -10\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}40\\80\end{pmatrix}$ (iii) If $A=\begin{pmatrix}5 & -4\\5 & -8\end{pmatrix}$, then A^{-1} is (A) $\frac{1}{20}\begin{pmatrix}-8 & 4\\-5 & 5\end{pmatrix}$ (B) $\begin{pmatrix}-8 & 4\\-5 & 5\end{pmatrix}$ (C) $\frac{-1}{20}\begin{pmatrix}-8 & 4\\-5 & 5\end{pmatrix}$ (D) $-\frac{1}{5}\begin{pmatrix}-8 & 4\\-5 & 5\end{pmatrix}$ (iv) The number of students in Class XII (A) 32 (B) 30 (C) 34 (D) 28 (v) Then the number chocolates distributed per student is (A) 34 (B) 30 (C) 32 (D) 36

Assertion and Reasoning Answers:

1.D		2. A		3.A		4.C		5.A		6.A		7.A		8.A
9.D		10.C		11.A		12.B		13.A		14.A		15.B		

Case Study 1 **i.** C ii.D iii.A iv.B v.A

Case Study 2 i.A ii.B iii.A iv.A v.Yes

Case Study 3 .i.A ii.A iii.B iv.D v.D

Case Study 4 **i.**.C ii.C iii.C iv.A v.B

Hnt:-

15. Suppose $X=\begin{pmatrix}a & b\\c & d\end{pmatrix}$ satisfies $X^2-4X+3I=\mathbf{O}$.: If $a+d\neq 4$, then there are just two matrices such X.

$X^2-4X+3I=\mathbf{O}$.:,(A-3I)(A-I) = 0i.e, $\begin{pmatrix}a-3 & b\\c & d-3\end{pmatrix}\begin{pmatrix}a-1 & b\\c & d-1\end{pmatrix}=\begin{pmatrix}0 & 0\\0 & 0\end{pmatrix}$ **If a+d ≠ 0**, then b=0,c=0

Then a =1,3 and d= 1,3 x= $\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$ or X= $\begin{pmatrix}3 & 0\\0 & 3\end{pmatrix}$ only two

If a +d = 0 ,teo equations in three variables will be obtained.

DETERMINEMTS

Multiple choice questions -

1). If for matrix A, $|A| = 3$, where matrix A is of order 2×2, then $|5A|$ is _____			
a) 9	b) 75	c) 15	d) 2
2). If the points A (3, -2), B(k,2) and C (8,8) are collinear, then the value of k is:			
a) 2	b) -3	c) 5	d) -4
3). Find the area of the triangle whose vertices are (3, 8), (– 4, 2) and (5, 2)			
a) 18	b) 34	c) 27	d) 61
4). The value of $\begin{vmatrix} \cos 15^0 & \sin 15^0 \\ \sin 15^0 & \cos 15^0 \end{vmatrix}$ is:			
a) 1	b) $\frac{1}{2}$	c) $\frac{\sqrt{3}}{2}$	d) 0
5). If A is a square matrix such that $A^2 = I$, then A^{-1} is equal to:			
a) 2A	b) O	c) A	d) A+I
6). If area of triangle is 35 sq units with vertices (2, – 6), (5, 4) and (k, 4). Then k is:			
a) 12	b) -2	c) -12, -2	d) 12, -2

7). A square matrix A is said to be singular if IAI =

a) 1 b) -1 c) 0 d) None of these

8). 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 Aij is Cofactors of aij, then value of Δ is given by:

a) a11 A31+ a12 A32 + a13 A33 c) a11 A11+ a12 A21 + a13 A31

b) a21 A11+ a22 A12 + a23 A13 d) a11 A11+ a21 A21 + a31 A31

9. $\begin{bmatrix} x & 2 \\ 18 & x \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 18 & 6 \end{bmatrix}$ then x is equal to:

a) 6 b) ±6 c) -1 d) -6

10. Given that A is a square matrix of order 3 and | A | = - 4, then | adj A | is equal to:

a) 4 b) -4 c) 16 d) -16

11. Given that A = $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ and $A^2 = 3I$, then:

a) $1 + \alpha^2 + \beta\gamma = 0$ b) $1 - \alpha^2 - \beta\gamma = 0$

c) $3 - \alpha^2 - \beta\gamma = 0$ d) $3 + \alpha^2 + \beta\gamma = 0$

12. Find the minor of the element 7 in the determinant $\Delta = \begin{vmatrix} 1 & 4 & 3 \\ 5 & 6 & 7 \\ 8 & 9 & 2 \end{vmatrix}$.

a)23 b) -23 c) 24 d) 0

13. If A, B and C are angles of a triangle, then the determinant $\begin{bmatrix} -1 & cosC & cosB \\ cosC & -1 & cosA \\ cosB & cosA & -1 \end{bmatrix}$

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

14. Find the minor of the element of second row and third column in the following det $\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$

a) 13 b) 4 c) 5 d) 0

15.	If A(3,4), B(-7,2) and C(x,y) are collinear, then: a) x+5y+17=0 b) x+5y+13=0 c) x-5y+17=0 d) none of these
16.	$A=\begin{bmatrix}3 & 4\\2 & 3\end{bmatrix}$, $B=\begin{bmatrix}-2 & -2\\0 & -1\end{bmatrix}$ then $(A+B)^{-1}$: (a) $\begin{bmatrix}-1 & 1\\1 & -\frac{1}{2}\end{bmatrix}$ (b) does not exist (c) is a skew-symmetric (d) none of these
17.	If the points (a_1, b_1), (a_2, b_2) and $(a_1 + a_2, b_1 + b_2)$ are collinear, then a) $a_1b_2 = a_2b_1$ b) $a_1 + a_2 = b_1 + b_2$ c) $a_2b_2 = a_1b_1$ d) $a_1 + b_1 = a_2 + b_2$
18.	18). Compute $(AB)^{-1}$ if: $A=\begin{bmatrix}1 & 1 & 2\\0 & 2 & -3\\3 & -2 & 4\end{bmatrix}$ and $B^{-1}=\begin{bmatrix}1 & 2 & 0\\0 & 3 & -1\\1 & 0 & 2\end{bmatrix}$ (a) $\frac{1}{19}\begin{bmatrix}16 & 12 & 1\\21 & 11 & -7\\10 & -2 & 3\end{bmatrix}$ (b) $\frac{1}{19}\begin{bmatrix}16 & 12 & 10\\21 & 11 & -2\\1 & -7 & 3\end{bmatrix}$ (c) $\frac{1}{19}\begin{bmatrix}16 & 12 & 1\\-21 & -11 & 7\\10 & -2 & 3\end{bmatrix}$ (d) $\frac{1}{19}\begin{bmatrix}16 & -21 & 1\\21 & 11 & 7\\10 & -2 & 3\end{bmatrix}$
19.	The area of a triangle with vertices (-3, 0), (3, 0) and (0, k) is 9 sq. units. then k= a) 9 b) 3 c) -9 d) 6
20.	**Find the adjoint of the matrix** $A=\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}$. (a) $\begin{bmatrix}4 & 2\\3 & 1\end{bmatrix}$ (b) $\begin{bmatrix}4 & -2\\-3 & 1\end{bmatrix}$ (c) $\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}$ (d) $\begin{bmatrix}1 & -2\\-3 & 4\end{bmatrix}$
21.	Let A be a non-singular square matrix of order 3 × 3. Then |adj A| is equal to: a) | A | b) $\lvert A \rvert^2$ c) $\lvert A \rvert^3$ d) 3|A|
22.	If A is an invertible matrix of order 2, then det (A^{-1}) is equal to (A) det (A) (B) $\frac{1}{\det(A)}$ (C) 1 (D) 0
23.	If A is a square matrix of order 4 such that |adj A| = 125, then |A| is ____ a) 25 b) 5 c) 15 d) 625

24.	Which of the following is a correct statement? a) Determinant is a square matrix b) Determinant is a number associated to a matrix c) Determinant is a number associated with the order of the matrix d) Determinant is a number associated to a square matrix
25.	If A = $\begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and kA = $\begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$, then the values of k, a and b respectively are: a) −6, −12, −18 b) −6, −4, −9 c) −6, 4, 9 d) −6, 12, 1

Aswers

1.B	**2.C**	**3.C**	**4.C**	**5.C**	**6.D**	**7.C**	**8.D**	**9.A**	**10.C**
11.C	**12.B**	**13.A**	**14.A**	**15.C**	**16.A**	**17.A**	**18.A**	**19.B**	**20.B**
21.B	**22.B**	**23.B**	**24.D**	**25.B**					

ASSERTION AND REASONING TYPE QUESTIONS

1.	**Assertion (A)**	The value of x for which $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$ is $\pm 2\sqrt{2}$
	Reason(R)	The determinant of a matrix A order 2x2, A= $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is = ad – bc
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

2.	**Assertion (A)**	The value of x for which $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$ is ± 6
	Reason(R)	The determinant of a matrix A order 2 x 2 , A= $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is = ab–dc
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

3.	**Assertion (A)**	If A= $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$ then $\lvert 3A \rvert = 9\lvert A \rvert$
	Reason(R)	If A is a square matrix of order n then $\lvert kA \rvert = k^n \lvert A \rvert$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
4.	**Assertion (A)**	If A is a non singular square matrix of order 3x3 and $\lvert A \rvert = 5$

		then $|adjA|$ is equal to 125
	Reason(R)	$|adjA| = (|A|)^{n-1}$ where n is order of A.
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

5.	**Assertion (A)**	Let $A^{-1} = \begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix}$ and $B^{-1} = \begin{bmatrix} 7 & 6 \\ 8 & 7 \end{bmatrix}$ then $(AB)^{-1} = \begin{bmatrix} 23 & 31 \\ 26 & 35 \end{bmatrix}$
	Reason(R)	$(AB)^{-1} = A^{-1}B^{-1}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

6.	**Assertion (A)**	Value of x for which the matrix $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 2 \\ -1 & 2 & x \end{bmatrix}$ is singular is 5
	Reason(R)	A square matrix is singular if $|A| = 0$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

7.	**Assertion (A)**	The minor of the element 3 in the matrix $\begin{bmatrix} 2 & 3 & 1 \\ 0 & -2 & 4 \\ 2 & 1 & 5 \end{bmatrix}$ is 8.
	Reason(R)	: Minor of an element $\mathbf{a_{ij}}$ of a matrix is the determinant

obtained by deleting its j^{th} row and i^{th} column

A Both A and R are true and R is the correct explanation of A

B Both A and R are true but R is NOT the correct explanation of A.

C A is true but R is false

D A is false but R is true

E Both A and R are false

8. **Assertion (A)** For two matrices A and B of order 3, $|A|$=2$|B|$ = -3 then if$|2AB|$ is -48.

Reason(R) For a square matrix A, A(adj A)=(adj A)A=$|A|$ I

A Both A and R are true and R is the correct explanation of A

B Both A and R are true but R is NOT the correct explanation of A.

C A is true but R is false

D A is false but R is true

E Both A and R are false

9. **Assertion (A)** Values of k for which area of the triangle with vertices (2, -6), (5,4) and (k,4) is 35 sq units are 12, 2.

Reason(R) Area of a triangle with vertices A (x_1, y_1),B (x_2, y_2) and C (x3, y3) is $\frac{1}{2}\begin{vmatrix} x1 & y1 & 1 \\ x2 & y2 & 1 \\ x3 & y3 & 1 \end{vmatrix}$

A Both A and R are true and R is the correct explanation of A

B Both A and R are true but R is NOT the correct explanation of A.

C A is true but R is false

D A is false but R is true

E Both A and R are false

10. **Assertion (A)** The points A(a, b+c), B(b, c+a) and C(c, a+b) are collinear.

Reason(R) Three points A (x_1, y_1) , B(x_2, y_2) and C(x3, y_3) are collinear if area of a triangle ABC is zero.

A Both A and R are true and R is the correct explanation of A

B	Both A and R are true but R is NOT the correct explanation of A.
C	A is true but R is false
D	A is false but R is true
E	Both A and R are false

11.	**Assertion (A)**	Inverse of the matrix $\begin{bmatrix}1 & -1 & 2\\0 & 2 & -3\\3 & -2 & 4\end{bmatrix}$ is the matrix $\begin{bmatrix}-2 & 0 & 1\\9 & 2 & -3\\6 & 1 & -2\end{bmatrix}$
	Reason(R)	: Inverse of a square matrix A, if it exits is given by $A^{-1} = \frac{1}{IAI}$ adjA
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
12.	**Assertion (A)**	For a matrix A=$\begin{bmatrix}2 & -1\\-3 & 4\end{bmatrix}$, A. adj A =$\begin{bmatrix}4 & 0\\0 & 4\end{bmatrix}$
	Reason(R)	For a square matrix A , A(adj A) = (adj A)A=$\lvert A\rvert$ I
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

13.	**Assertion (A)**	In a square matrix of order 3 the minor of an element a_{22} is 6 then cofactor of $a_{22}$is -6.
	Reason(R)	Cofactor an element $a_{ij} = A_{IJ}= (-1)^{i+j}M_{ij}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	

D	A is false but R is true
E	Both A and R are false

14.	**Assertion (A)**	Inverse of a matrix A = $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ is the matrix A^{-1} = $\begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$
	Reason(R)	: Inverse of a square matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$.
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

15.	**Assertion (A)**	If A is an invertible matrix of order 2, and det A= 3 then det(A^{-1})is equal to $\frac{1}{3}$
	Reason(R)	If A is an invertible matrix of order 2 then det (A^{-1}) = $\det A$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

16.	**Assertion (A)**	The equation of the line joining (1,2) and (3,6) using determinants is y= 3x.
	Reason(R)	The area of ΔPAB is zero if P(x, y) is a point on the line joining a A and B.
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

CASE STUDY TYPE QUESTIONS

CS– 1

Three shopkeepers Ujjwal, Lohith, and Kundan are using polythene bags, handmade bags and newspaper's envelope as carry bags. It is found that the shopkeepers Ujjwal, Lohith, and Kundan are using (20, 30, 40), (30, 40, 20), and (40, 20, 30) polythene bags, handmade bags, and newspapers envelopes respectively. They spent □250, □270, and □200 on these carry bags respectively. Let the cost of polythene bag, handmade bag and newspaper envelope costs are x,y and z respectively.

i. What is the Linear equation representing amount spent by Lohith on carry bags?

a. 20x + 30 y + 40 z = 250 b. 30x + 40 y + 20 z = 270
c. 40x + 20 y + 30 z = 270 d. 250x + 270 y + 200 z = 0

ii. What is the correct representation of the above problem in matrix form?

a. $\begin{bmatrix} 20 & 30 & 40 \\ 30 & 40 & 20 \\ 40 & 20 & 30 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 250 \\ 270 \\ 200 \end{bmatrix}$ b. $\begin{bmatrix} 40 & 20 & 30 \\ 30 & 40 & 20 \\ 20 & 30 & 40 \end{bmatrix} \begin{bmatrix} z \\ y \\ x \end{bmatrix} = \begin{bmatrix} 200 \\ 270 \\ 250 \end{bmatrix}$

c. $\begin{bmatrix} 30 & 40 & 20 \\ 20 & 30 & 40 \\ 40 & 20 & 30 \end{bmatrix} \begin{bmatrix} y \\ x \\ z \end{bmatrix} = \begin{bmatrix} 270 \\ 250 \\ 200 \end{bmatrix}$ d. All the above.

iii. Adjoint of $\begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 2 \\ 4 & 2 & 3 \end{bmatrix} =$

a. $\begin{bmatrix} 8000 & -1000 & -10000 \\ -1000 & -10000 & 8000 \\ -10000 & 8000 & -1000 \end{bmatrix}$ b. $\begin{bmatrix} 8 & -1 & -10 \\ -1 & -10 & 8 \\ -10 & 8 & -1 \end{bmatrix}$

c. $\begin{bmatrix} 20 & 30 & 40 \\ 30 & 40 & 20 \\ 40 & 20 & 30 \end{bmatrix}$ d. $\begin{bmatrix} 4 & 3 & 2 \\ 2 & 4 & 3 \\ 3 & 2 & 4 \end{bmatrix}$

iv. What is the cost of one newspaper bag?

a. □ 1 b. □ 2 c. □ 3 d. □ 5

v. Find the total amount spent by ujjwal for handmade bags ?

a. 100 b. 200 c. 150d. 250

CS– 2

Each triangular face of the square pyramid of Peace in Kazakhstan is made up of 25 smaller equilateral triangles as shown in the figure.

Using the above information and concept of determinants, answer the following questions.

i. If the vertices of one of the smaller equilateral triangles are (0, 0), (3, $\sqrt{3}$) and (3, -$\sqrt{3}$), then the area of such triangle is

a. $\sqrt{3}$sq. units b. 2 $\sqrt{3}$ sq. units c. 3 $\sqrt{3}$ sq. units d. none of these

ii. The lateral surface area of the Pyramid is
a. 300√3 sq. unit b. 75 sq. unit c. 75 √3 sq. unit d. 300 sq. unit

iii. The length of each altitude of a smaller equilateral triangle is
a. 2 units b. 3 units c. 2 $\sqrt{3}$ units d. 4 units

iv. If (2, 4), (2, 6) are two vertices of a smaller equilateral triangle, then the third vertex is

a. $(2 \pm \sqrt{3}, 5)$ b. $(2 \pm \sqrt{3}, \pm 5)$c. $(2 \pm \sqrt{5}, 3)$ d. $(2 \pm \sqrt{5}, \pm 3)$
v. Let A (a, 0), B (0, b) and C (1, 1) be three points. If $\frac{1}{a}$ + $\frac{1}{b}$ = 1, then the three points are

a. vertices of an equilateral triangle b. vertices of a right-angled triangle
c. collinear d. vertices of an isosceles triangle

CS– 3

Area of a triangle whose vertices are (x_1, y_1), (x_2, y_2) and (x_3, y_3) is given by the determinant

$$\Delta = 1/2 \begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix}$$

Since, area is a positive quantity, so we always take the absolute value of the determinant A. Also, the area of the triangle formed by three collinear points is zero. Based on the above information, answer the following questions.

i. Find the area of the triangle whose vertices are (-2, 6), (3, -6), and (1, 5).

ii. 30 sq. units b. 35 sq. units c. 40 sq. units d. 15.5 sq. units

If the points (2, -3), (k, -1) and (0, 4) are collinear, then find the value of 4k.

a. 4 b. $\frac{7}{140}$ c. 47 d. $\frac{40}{7}$

iii. If the area of a triangle ABC, with vertices A (1, 3), B (0, 0) and C (k, 0) is 3 sq. units, then a value of k is

a. 2 b. 3 c. 4 d. 5

iv . Using determinants, find the equation of the line joining the points A(1,2) & B(3,6).

a. y = 2x b. x = 3y c. y = x d. 4x - y = 5

V. If A is (11, 7), B is(5, 5) and C is (-1, 3), then

a) △ABC is scalene triangle c. △ABC is equilateral triangle

b) A, B and C are collinear d. None of these

Answers

ASSERTION AND REASONING

1	A	2	C	3	D	4	D	5	E
6	D	7	E	8	B	9	D	10	A
11	A	12	D	13	D	14	C	15	C
16	D	17	B	18	C	19	D	20	B

CASE STUDY

CS-1	**I)b**	**II) d**	**III) b**	**iv) b**	**V) c**
CS-2	**I)c**	**II) a**	**III) b**	**iv) a**	**V) c**
CS-3	**I)d**	**II) d**	**III) a**	**iv) a**	**V) b**

CONTINUITY AND DIFFERENTIABILITY

Multiple choice questions -

1	A function f(x) is continuous at x=a (a ϵ Domain of f), if		
		(a) $f(a) = \lim_{x\to a+} f(x)$	(b) $\lim_{x\to a-} f(x) = \lim_{x\to a+} f(x)$
		(c) $\lim_{x\to a-} f(x) = \lim_{x\to a+} f(x) = f(a)$	(d) $\lim_{x\to a-} f(x) = f(a)$
2	If f(x) = |x | +|x - 2|, then		
		(a) f(x) is continuous at x=0 but not at x=2	(b) f(x) is continuous at x=0 and at x=2
		(c) f(x) is continuous at x=2 but not at x=0	(d)None of these
3	Suppose f(x) is defined on [a,b].Then the continuity of f(x) at x=a means		
		(a) $\lim_{x\to a+} f(x) = f(a)$	(b) $\lim_{x\to a-} f(x) = f(a)$
		(c) $\lim_{x\to a+} f(x) = f(b)$	(d) $\lim_{x\to a-} f(x) = f(b)$
4	Suppose f(x) is defined on [a,b].Then the continuity of f(x) at x = b means		
		$(a)\ \lim_{x\to b+} f(x) = f(a)$	$(b)\ \lim_{x\to b-} f(x) = f(a)$
		$(c)\ \lim_{x\to b+} f(x) = f(b)$	$(d)\ \lim_{x\to b-} f(x) = f(b)$
5	If the function f(x) = $\frac{x(e^{sinx} - 1)}{(1-cosx)}$ is continuous at x = 0, then f(0) is		
		a) 1	b) 0
		c) 2	d) 1/2
6	Let f(x) = x |x|, then f'(0) is equal to		
		(a)1	(b) -1
		(c) 0	(d) None of these

7	The function f(x) = $\begin{cases} \frac{\sin 3x}{x}, x \neq 0 \\ \frac{k}{2}, x = 0 \end{cases}$ is continuous at x=0, then k= a) 3 / (b) 6 (c)9 / (d) 12
8	The function f(x) = cot x is discontinuous on the set (a) {x: x= nл, nϵ Z} / (b) {x: x= 2nл, nϵ Z} (c) {x: x= nл/2, nϵ Z} / (d) {x: x= (2n+1)л, nϵ Z}
9	The function f(x) = x – [x] , where [.] denotes the greatest integer function is (a) Continuous everywhere. / (b) Continuous at integer points only. (c) Continuous at non-integer points only / (d) Differentiable everywhere
10	If f(x)= -$\sqrt{25 - x^2}$, *then* $\lim_{x\to 1} \frac{f(x)-f(1)}{x-1}$ *is equal to* (a) 1/24 / (b)1/5 (c) $-\sqrt{24}$ / (d)$\frac{1}{\sqrt{24}}$
11	If f(x) = $\begin{cases} x^2 + 3x + a\ ,\ x \leq 1 \\ bx + 2, x > 1 \end{cases}$ is everywhere differentiable, then the values of a and b are (a) a=3 & b=5 / (b) a=0 & b=5 (c) a=0 & b=3 / (d) a=3 & b=3
12	If f(x) = | cosx - sinx | , then f'(л/3) is equal to (a)$\frac{(\sqrt{3}+1)}{2}$ / (b)$\frac{\sqrt{3}}{2}$ (c)$\frac{(\sqrt{3}-1)}{2}$ / (d) None of these
13	If x – y = π, then $\frac{dy}{dx}$ = a) 0 / b) 1 c) -1 / d) 2

14	If y = sin(x^2) , then $\frac{dy}{dx}$ =
	a) 2x cosx^2 | b) 2x cosx
	c) 2x sinx^2 | d) 2x sinx
15	If 2x + 3y = sinx, then $\frac{dy}{dx}$ =
	a) $\frac{sinx-3}{2}$ | b) . $\frac{sinx-2}{3}$
	c) $\frac{cosx-3}{2}$ | d) $\frac{cosx-2}{3}$
16	If y = A sinx + B cosx ,then $\frac{d^2y}{dx^2}$ + y =
	a)1 | b) 2
	c) 0 | d) 2
17	If y = e^{x^3} , then $\frac{dy}{dx}$ =
	a. 3$x^2 e^{x^3}$ | b. $x^2 e^{x^3}$
	c. . 3e^{x^3} | d. e^{x^3}
18	If y = log(logx) , x > 1 , then $\frac{dy}{dx}$ =
	a. $\frac{x}{xlogx}$ | b. $\frac{logx}{x}$
	c. $\frac{x}{logx}$ | d. $\frac{1}{xlogx}$
19	If x = 4t and y = $\frac{4}{t}$, then $\frac{dy}{dx}$ =
	a. $\frac{1}{t^2}$ | b. $\frac{-1}{t^2}$
	c. $\frac{2}{t^2}$ | d. $\frac{-2}{t^2}$
20	If x = $\sqrt{a^{\sin^{-1} t}}$ and y = $\sqrt{a^{\cos^{-1} t}}$, then $\frac{dy}{dx}$ =
	a. $\frac{y}{x^2}$ | b. $\frac{-y}{x}$
	c. $\frac{x}{t^2}$ | d. $\frac{-y}{t^2}$
21	y = $\sin^{-1}\frac{2x}{1+x^2}$, then $\frac{dy}{dx}$ =
	a. $\frac{2}{1+x^2}$ | b.$\frac{-2}{1+x^2}$
	c. $\frac{2}{1-x^2}$ | d. $\frac{-2}{1-x^2}$

22	If e^x(x + 1) = 1, then which of the following is true:
	a. $\frac{d^2 y}{dx^2} = (\frac{dy}{dx})^2$ | b. $\frac{d^2 y}{dx^2} = \frac{dy}{dx}$
	c. $(\frac{d^2 y}{dx^2})^2 = (\frac{dy}{dx})^2$ | d. $\frac{d^2 y}{dx^2} = \frac{dy}{dx}$
23	y = $\cos^{-1}(sinx)$,then $\frac{dy}{dx}$ =
	a.0 | b. 1
	c. -1 | d.2
24	The derivative of $\tan^{-1}(\frac{sinx}{1+cosx})$ with respect to x is
	a. $\frac{1}{2}$ | b. $\frac{x}{2}$
	c. $\frac{-1}{2}$ | d. $\frac{-x}{2}$
25	If x = a(cost + t sint) and y = a (sint – t cost), (if 0< t <$\frac{\pi}{2}$), then $\frac{d^2 y}{dx^2}$ =
	a. $\frac{sec^2 t}{t}$ | b.. $\frac{sec^3 t}{t}$
	c. $\frac{sec^2 t}{at}$ | d. $\frac{sec^3 t}{at}$
26	If Rolle's theorem holds true for the function f(x) = x^2 +2x – 8 in [-4,2], then there exits **c** in (-4,2) such that f'(c) = 0 then the value of **c** is
	a.0 | b. 1
	c. -1 | d.2
27	If Lagrange's mean value theorem holds true for the function f(x) = x^2 - 4x – 3 in [1,4], then there exits **c** in (1,4) such that f'(c) = $\frac{f(b)-f(a)}{b-a}$, then the value of **c** is
	a .$\frac{3}{2}$ | b. 1
	c. $\frac{5}{2}$ | d.2

Answers for MCQ's

1	c	2	b	3	a	4	d	5	c
6	c	7	b	8	a	9	c	10	d
11	a	12	a	13	b	14	a	15	d
16	c	17	a	18	d	19	b	20	b
21	a	22	a	23	c	24	a	25	d
26	c	27	c						

ASSERTION AND REASONING TYPE QUESTIONS

1.	**Assertion (A)**	The value of the constant 'k' so that f(x) = $\begin{cases} kx^2, if\ x \le 2 \\ 3, if\ x > 2 \end{cases}$ is continuous at x =2 is k = 4/3.
	Reason(R)	A function f(x) is continuous at a point x= a of its domain if $\lim_{x \to a} f(x) = f(a)$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

2.	**Assertion (A)**	The function f(x) = $\begin{cases} 12x - 13, if\ x \le 3 \\ 2x^2 + 5, if\ x > 3 \end{cases}$ is differentiable at x= 3.
	Reason(R)	The function f(x) is differentiable at x = c of its domain if Left hand derivative of f at c= Right hand derivative of f at c.
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

3.	**Assertion (A)**	f(x) = | x – 1| + | x – 2| is continuous but not differentiable at x =1,2.
	Reason(R)	Every differentiable function is continuous
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
4.	**Assertion (A)**	If f(x) = | cosx | , then $f'\left(\frac{\pi}{4}\right) = \frac{-1}{\sqrt{2}}$ and $f'\left(\frac{3\pi}{4}\right) = \frac{1}{\sqrt{2}}$
	Reason(R)	$f(x) = \lvert cosx \rvert = \begin{cases} cosx, if\ 0 \le x \le \pi/2 \\ -cosx, if\ \pi/2 < x \le \pi \end{cases}$

A	Both A and R are true and R is the correct explanation of A
B	Both A and R are true but R is NOT the correct explanation of A.
C	A is true but R is false
D	A is false but R is true
E	Both A and R are false

5.	**Assertion (A)**	$\frac{d}{dx}(x^2 + x + 1\,)^4 = 4(x^2 + x + 1)^3(2x + 1)$
	Reason(R)	$(\boldsymbol{fog})' = \boldsymbol{f}'[\boldsymbol{g}(\boldsymbol{x})].\boldsymbol{g}'(\boldsymbol{x})$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

6.	**Assertion (A)**	If y= tan $5x^0$, then $\frac{dy}{dx} = \frac{5\pi}{180} sec^2(\,5x^0)$
	Reason(R)	$\pi^c = 90^0$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

7.	**Assertion (A)**	If y = $tan^{-1}\left(\frac{cosx+sinx}{sinx-cosx}\right)$, $\frac{-\pi}{4} < x < \frac{\pi}{4}$, then $\frac{dy}{dx} = \; -1$
	Reason(R)	$\frac{cosx + sinx}{sinx - cosx} = tan\left(x + \frac{\pi}{4}\right)$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

8.	**Assertion (A)**	If $x^2 + 2xy + y^3 = 42$, $then\ \frac{dy}{dx} = \frac{2\,(x+y\,)}{(2x+3\,y^2)}$
	Reason(R)	$\frac{dy^n}{dx} = ny^{(n-1)}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

9.	**Assertion (A)**	If y = $log_7(x^2 + 7x + 4), then\ \frac{dy}{dx} = \frac{(2x+7)}{(x^2+7x+4),}$
	Reason(R)	$log_b a = \frac{log_e a}{log_e b}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
10.	**Assertion (A)**	If x = at^2 and y = 2at where ‘t’ is the parameter and ‘a’ is a constant, then $\frac{d^2y}{dx^2} = \frac{-1}{t^2}$.
	Reason(R)	$\frac{d^2y}{dx^2} = \frac{d^2y}{dt^2} \div \frac{d^2x}{dt^2}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

11.	**Assertion (A)**	$\frac{dx^{sinx}}{dx} = x^{sinx}[\,(cosx\,)logx\, + \frac{sinx}{x}]$
	Reason(R)	$if\ y = x^{f(x)}\ then\ \frac{dy}{dx} = x^{f(x)}[f'(x)logx + \frac{f(x)}{x}]$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

12.	**Assertion (A)**	f(x)=[x] greatest integer function is not differentiable at x=2
	Reason(R)	The greatest integer function is not continuous at any integer
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	
13.	**Assertion (A)**	The derivative of log sinx w.r.t. $\sqrt{cosx}$ is 2$\sqrt{cosx}\ cotx\ cosecx$
	Reason(R)	The derivative of u w.r.t. v is $\frac{\frac{du}{dx}}{\frac{dv}{dx}}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

14.	**Assertion (A)**	If $f(x) = \begin{vmatrix} x+a^2 & ab \\ ab & x+b^2 \end{vmatrix}$ then $f'(x) = 2x+a^2+b^2$
	Reason(R)	If $\Delta = \begin{vmatrix} f(x) & g(x) \\ u(x) & v(x) \end{vmatrix}, Then \frac{d\Delta}{dx} = \begin{vmatrix} f'(x) & g'(x) \\ u(x) & v(x) \end{vmatrix} + \begin{vmatrix} f(x) & g(x) \\ u'(x) & v'(x) \end{vmatrix}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

15.	**Assertion (A)**	$if\ y = sin^{-1}\frac{2x}{1+x^2}\ then\ \frac{dy}{dx} = \frac{2}{1+x^2}$
	Reason(R)	$sin\ 2\theta = \frac{2tan\theta}{1+tan^2\theta}$
A	Both A and R are true and R is the correct explanation of A	
B	Both A and R are true but R is NOT the correct explanation of A.	
C	A is true but R is false	
D	A is false but R is true	
E	Both A and R are false	

CASE STUDY TYPE QUESTIONS

CASE STUDY

CS 1	Let f(x) be a real valued function, then its Left Hand Derivative (L.H.D) at the point **a** is **f'(a-) =** $\lim_{x\to 0}\frac{f(a-h)-f(a)}{-h}$ and Right Hand Derivative (R.H.D) at the point **a** is **f'(a+) =** $\lim_{x\to 0}\frac{f(a+h)-f(a)}{h}$**,** also a function f(x) is said to be differentiable at **x= a** and if its L.H.D and R.H.D at **x = a** exist and are equal. For the function f(x) = $\begin{cases} \lvert x-3\rvert & , x\geq 1 \\ \frac{x^2}{4}-\frac{3x}{2}+\frac{13}{4} & , x<1 \end{cases}$ Answer the following questions:
1	L.H.D of f(x) at x = 1 is (a) 1 (b). -1 (c) 0 (d) 2
2	f(x) is non differentiable at (a) x = 1 (b) x = 2 (c) x = 3 (d) x = 4
3	Find the value of f'(2) (a) 1 (b) 2 (c) 3 (d) -1
4	Find the value of f'(-1) (a) x = 1 (b) x = 2 (c) x = -2 (d) x = -1
5	R.H.D of f(x) at x = 1 is (a) 1 (b) -1 (c) 0 (d) 2
CS 2	A function f(x) is said to be continuous in an open interval (a,b) , if it is continuous at every point in the interval. A function f(x) is said to be continuous in an closed interval [a,b] , if f(x) is continuous in (a,b) and

	$\lim_{h\to 0} f(a+h)$ **= f(a)** **and** $\lim_{h\to 0} f(b-h)$ **= f(b).** **If** function f(x) = $\begin{cases} \frac{\sin(a+1)x+\sin x}{x}, & x<0 \\ c, & x=0 \\ \frac{\sqrt{x+bx^2}-\sqrt{x}}{bx^{\frac{3}{2}}}, & x>0 \end{cases}$ Is continuous at x = 0 ,**then answer the following questions**:
1	The value of **a**is : (a) -3/2 | (b) 1/2 (c) 0 | (d) -1/2
2	The value of **b**is : (a) 1 | (b) -1 (c) 0 | (d) Any real number except 0
3	The value of **c**is : (a) 1 | (b) 1/2 (c) -1 | (d) -1/2
4	The value of **c - a** is : (a) 1 | (b) -1 (c) 0 | (d) 2
5	The value of **a +c** is : (a) 1 | (b) -1 (c) 0 | (d) 2
CS 3	Let x = f(t) and y = g(t) be the parametric forms with **t** as a parameter, then $\frac{dy}{dx} = \frac{dy}{dt} \cdot \frac{dt}{dx} = \frac{g'(t)}{f'(t)}$ where f '(t) $\neq 0$. **On the basis of the above information answer the following questions**:
1	The derivative of f (tanx) w.r.t g (secx) at x = $\frac{\pi}{4}$, where f ' (1) = 2 and g ' ($\sqrt{2}$) = 4 is :

	(a) $\frac{1}{\sqrt{2}}$	(b) $\sqrt{2}$	
	(c) 0	(d) 1	
2	The derivative of $\sin^{-1}(\frac{2x}{1+x^2})$ w.r.t $\cos^{-1}(\frac{1-x^2}{1+x^2})$ is :		
	(a) 1	(b) -1	
	(c) 2	(d) 4	
3	The derivative of e^{x^3} w.r.t logx is :		
	(a) e^{x^2}	(b) $3x^2$ .2. e^{x^3}	
	(c) $3x^3$. e^{x^3}	(d) $3x^2e^{x^2}$ + 3x	
4	The derivative of $\cos^{-1}(2x^2$ - 1) w.r.t $\cos^{-1} x$ is :		
	(a) 2	(b) $\frac{-1}{2\sqrt{1-x^2}}$	
	(c) $\frac{2}{x}$	(d) 1 - x^2	
5	If y = $\frac{1}{4}u^4$ and u = $\frac{2}{3}x^3$, then $\frac{dy}{dx}$ = :		
	(a) $\frac{2}{27}x^9$	(b) $\frac{16}{27}x^{11}$	
	(c) $\frac{8}{27}x^9$	(d) $\frac{2}{27}x^{11}$	

CS 4

A function f(x) will be discontinuous at **x = a** if f(x) has

1.Discontinuity of first kind:

$\lim_{h\to 0} f(a-h)$ **and** $\lim_{h\to 0} f(a+h)$ **, both exist,** but are **not equal**.

It is also known as irremovable discontinuity.

2.Discontinuity of second kind:

If **none** of the limits $\lim_{h\to 0} f(a-h)$ **and** $\lim_{h\to 0} f(a+h)$ **exist.**

3.Discontinuity of third kind:

Removable discontinuity – If $\lim_{h\to 0} f(a-h)$ **and** $\lim_{h\to 0} f(a+h)$ both **exist** and are **equal** , but **not equal** to f(a).

Based on the above information answer the following questions:

1	If f(x) = $\begin{cases} \frac{x^2-9}{x-3}, & x \neq 3 \\ 4, & x = 3 \end{cases}$ Then at x = 3 (a) f has removable discontinuity (b) f is continuous (c) f has irremovable discontinuity (d) None of these
2	Let f(x) = $\begin{cases} x+2, if\ x \leq 4 \\ x+4, if\ x > 4 \end{cases}$ Then at x = 4 , (a) f has irremovable discontinuity. (b) f is continuous (c) f has removable discontinuity (d) None of these
3	If f(x) = $\begin{cases} \frac{x^2-4}{x-2}, & x \neq 2 \\ 5, & x = 2 \end{cases}$ Then at x = 2 (a) f has removable discontinuity (b) f is continuous (c) f has irremovable discontinuity (d) f is continuous if f(2) = 3.
4	Let f(x) = $\begin{cases} \frac{e^x-1}{\log(1+2x)}, & x \neq 0 \\ 7, & x = 0 \end{cases}$ Then at x = 0, (a) f has removable discontinuity (b) f is continuous (c) f has irremovable discontinuity (d) f is continuous if f(0) = 2.
5	If f(x) = $\begin{cases} \frac{x-\lvert x\rvert}{x}, & x \neq 0 \\ 2, & x = 0 \end{cases}$ Then at x= 2, (a) f has removable discontinuity (b) f is continuous (c) f has irremovable discontinuity (d) f is continuous if f(0) = 2.
CS 5	A function f(x) is said to be continuous at **x = c** ,if the function is defined at x = c and if the value of the function at x = c equals the limit of the function at x = c .

	i.e $\lim_{x \to c} f(x)$ = **f(c) .** If the function f(x) is not continuous at **x = c** , we say that f is discontinuous at c, and c is called the point of discontinuity of f. **Based on the above information answer the following questions**:
1	The number of points of discontinuity of f(x) = in [3,7] is : (a) 4 | (b) 5 (c) 6 | (d) 8
2	Suppose f and g are two real functions continuous at a real number c then : (a)f + g is continuous at x = c | (b) f + g is discontinuous at x = c. (c) f + g may or may not be continuous at x = c | (d) None of these
3	Find the value of k, so that the given function f(x) is continuous at x = 5. f (x) = $\begin{cases} kx + 1, & x \leq 5 \\ 3x - 5, & x > 5 \end{cases}$ (a) 3/5 | (b) 1/5 (c) 4/5 | (d) 9/5
4	If f(x) = $\|x\|$ is continuous and g(x) = sinx is continuous , then: (a) sin$\|x\|$ is continuous. | (b) sin$\|x\|$ is discontinuous. (c) sin $\|x\|$ may or may not be continuous. | (d) None of these.
5	Find the value of k, so that the given function f(x) is continuous at x = 2. **f(x) =** $\begin{cases} \boldsymbol{kx^2}, & \boldsymbol{x \leq 2} \\ \boldsymbol{3}, & \boldsymbol{x} > 2 \end{cases}$ (a) 1 | (b) 1/4 (c) 3/4 | (d) 11/4

Answers

ASSERTION AND REASONING

1	D	2	A	3	B	4	A	5	A
6	C	7	D	8	E	9	D	10	E
11	A	12	A	13	A	14	A	15	A

CASE STUDY

CS-1	I) b	II) c	III) d	iv) c	v) b
CS-2	I) a	II) d	III) d	iv) d	V) b
CS-3	I) a	II) a	III) c	iv) a	V) b
CS-4	i) a	ii) a	iii) a	iv) a	v) c
CS-5	i) a	ii) a	iii) d	iv) a	v) c

APPLICATION OF DERIVATIVES

MULTIPLE CHOICE QUESTIONS

INCREASING AND DECREASING FUNCTIONS

1	Find the intervals in which the functions f(x) = x^2 – 4x + 6 is strictly increasing (a) $(-\infty, 2) \cup (2, \infty)$ (b) $(2, \infty)$ (c) $(-\infty, 2)$ (d) $(-\infty, 2] \cup [2, \infty)$
2	The function $f(x) = 3 - 4x + 2x^2 - \frac{1}{3}x^3$ is (a) Increasing on $\Re$ (b) Decreasing on $\Re$ (c) Neither increasing nor decreasing (d) None of these
3	The real function f(x) = $2x^3 - 3x^2 - 36x + 7$ is: (a) Strictly increasing in $(-\infty, -2)$ and strictly decreasing in $(-2, \infty)$ (b) Strictly decreasing in $(-2, 3)$ © Strictly decreasing in $(-\infty, 3)$ and strictly increasing in $(3, \infty)$ (d) Strictly decreasing in $(-\infty, -2) \cup (3, \infty)$
4	The function f(x) = $-x^3 + 3x^2 - 3x + 100$, $\forall x \in \mathcal{R}$ is (a) Strictly increasing (b) Strictly decreasing (c) Neither increasing nor decreasing (d) Decreasing
5	In which interval the function f(x) = $3x^2 - 7x + 5$ is strictly increasing (a) $\left(-\infty, \frac{7}{6}\right)$ (b) $(-\infty, \infty)$ (c) $\left(0, \frac{7}{6}\right)$ (d) $\left(\frac{7}{6}, \infty\right)$
6	The interval on which the function f(x) = $2x^3 + 9x^2 + 12x - 1$ is decreasing is (a) $[-1, \infty)$ (b) [– 2, – 1] (c) $(-\infty, -2]$ (d) [– 1, 1]
7	The function $f(x) = 1 - x^3 - x^5$ is decreasing for (a) $1 \le x \le 5$ (b) $x \le 1$ (c) $x \ge 1$ (d) all values of x
8	If y = $x(x-3)^2$ decreases for the values of 'x' given by (a) $1 < x < 3$ (b) $x < 0$ (c) $x > 0$ (d) $0 < x < \frac{3}{2}$
9	The function $f(x) = x - \frac{1}{x}, x \in \Re, x \neq 0$ is (a) Increasing for all $x \in \Re$ (b) Decreasing for all $x \in \Re$ (c) Increasing for all $x \in (0, \infty)$ (d) Neither increasing nor decreasing
10	The function $f(x) = \frac{5}{x} + 2$ is strictly decreasing in

(a) $\mathcal{R}$	(b) $\mathcal{R}-\{0\}$
(c) $[0,\infty)$	(d) None

11 Find the interval in which f(x) = log (1 + x) – $\frac{x}{2+x}$ is increasing.

(a) (0, ∞)	(b) (−∞, 0)
(c) (−∞, 3)	(d) none of these

12 The function f(x) = tanx – x

(a) Always increases	(b) Always decreases
(c) Never increases	(d) Sometimes increases and sometimes decreases

13 The function f(x) = x + sinx is

(a) Always increasing	(b) Always decreasing
(c) Increasing for certain range of x	(d) None of these

14 The interval in which $f(x) = sinx + cosx, 0 \leq x \leq 2\pi$ is strictly decreasing in

(a) $\left[0,\frac{\pi}{2}\right]$	(b)$\left(\frac{\pi}{4},\frac{5\pi}{4}\right)$
(c)$(\frac{5\pi}{4},2\pi]$	(d) $[0,\frac{\pi}{4})$

15 The function f(x) = $4\sin^3x - 6\sin^2x + 12\sin x + 100$ is strictly

(a) Increasing in $\left(0,\frac{3\pi}{2}\right)$	(b) Decreasing in $\left(\frac{\pi}{2},\pi\right)$
(c) Decreasing in $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$	(d) Decreasing in $\left(0,\frac{\pi}{2}\right)$

16 The length of the longest interval, in which the function f(x) = $3\sin x - 4\sin^3x$ is increasing, is

(a) $\frac{\pi}{3}$	(b) $\frac{\pi}{2}$
(c) $\frac{3\pi}{2}$	(d) π

17 The function f(x) = sin3x is strictly decreasing on

(a) $\left[0,\frac{\pi}{6}\right]$	(b)$\left[0,\frac{\pi}{4}\right]$
(c) $\left[\frac{\pi}{6},\frac{\pi}{2}\right]$	(d) $\left[0,\frac{\pi}{2}\right]$

18 Which of the following functions is decreasing on $\left(0,\frac{\pi}{2}\right)$

(a) Sin2x	(b) tan x
(c) cosx	(d) cos3x

19 The function f(x) = logx is strictly increasing on

(a) (0, ∞)	(b) (−∞, 0)
(c) (−∞, ∞)	(d) None

20 The function y = $2x^2$ – log|x|, x ≠ 0 decreases when x ∈

(a) $(-1,1)$	(b) $\mathcal{R}-\{-\frac{1}{2},\frac{1}{2}\}$
(c) $(-\frac{1}{2},0)\cup(\frac{1}{2},\infty)$	(d) $(-\infty,-\frac{1}{2})\cup(0,\frac{1}{2})$

21 The function f(x) = e^{2x} is strictly increasing on

(a) (0, ∞)	(b) (−∞, 0)
(c)(−∞, ∞)	(d) None

22	The intervals in which $y = x^2e^{-x}$ is increasing (a) $(-\infty, \infty)$ | (b) (– 2, 0) (c) $(2, \infty)$ | (d) (0, 2)
23	The function f(x) = x – [x] in the interval [0, 1] is (a) Increasing | (b) Decreasing (c) Neither increasing and decreasing | (d) None of the above.
24	The function f(x) = $x^3 - 9kx^2 + 27x + 30$ is increasing on $\mathcal{R}$, if (a) $-1 \leq k < 1$ | (b) k <– 1 or k > 1 (c) 0 < k < 1 | (d) – 1 < k < 0
25	The value of 'b'for which the function f(x) = x + cosx + b is strictly decreasing over $\mathcal{R}$ is : (a) b < 1 | (b) No value of b exists((c) b ≤ 1 | (d) b ≥ 1

TANGENTS AND NORMALS

26	The tangent to the parabola $x^2 = 2y$ at the point $(1, \frac{1}{2})$ makes with the x – axis an angle of (a) 0° | (b) 45° (c) 30° | (d) 60°
27	The curve $y = x^{\frac{1}{5}}$ has at (0, 0) (a) A vertical tangent (parallel to y – axis) | (b) A horizontal tangent (parallel to x – axis) (c) An oblique tangent | (d) No tangent
28	The slope of the normal to the curve y = $2x^2$ + 3 sinx at x = 0 is (a) $\frac{1}{3}$ | (b) 3 (c) – 3 | (d) $-\frac{1}{3}$
29	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) $\frac{22}{7}$ | (b) $\frac{6}{7}$ (c) $\frac{7}{6}$ | (d) $-\frac{6}{7}$
30	The slope of the tangent to the curve x = asint and y = a(*cos* t + log(tan($\frac{t}{2}$)) at the point 't' is (a) tan t | (b) cot t (c) tan ($\frac{t}{2}$) | (d) none of these
31	The slope of the normal to the curve $x = a(\theta - sin\theta), y = a(1 - cos\theta)$ at $\theta = \frac{\pi}{2}$ is (a) 0 | (b) undefined (c) – 1 | (d) 1
32	Tangents to the curve $x^2 + y^2 = 2$ at the points (1, 1) and (– 1, 1) are (a) Parallel | (b) Perpendicular © Intersecting but not at right angles | d) None of these

33	The equation of the tangent to the curve $y^2 = 4ax$ at the point $(at^2, 2at)$ is (a) $ty = x + at^2$ (b) $ty = x - at^2$ (c) $tx + y = at^3$ (d) none of these
34	The normal to the curve $x^2 = 4y$ passing through (1, 2) is (a) $x + y = 3$ (b) $x - y = 3$ (c) $x + y = 1$ (d) $x - y = 1$
35	The normal at the point (1, 1) on the curve $2y + x^2 = 3$ is $x + y = 0$ (b) $x - y = 0$ (c) $x + y + 1 = 0$ (d) $x - y = 0$
36	The equation of the normal to the curve $y = \sin x$ at (0, 0) is (a) $x = 0$ (b) $x + y = 0$ (c) $y = 0$ (d) $x - y = 0$
37	The equation of the normal to the curve $3x^3 - y^2 = 8$ which is parallel to the line $x + 3y = 8$ is (a) $3x - y = 8$ (b) $3x + y + 8 = 0$ (c) $x + 3y \pm 8 = 0$ (d) $x + 3y = 0$
38	For which value of ‘m’is the line $y = mx + 1$ a tangent to the curve $y^2 = 4x$? (a) 1/2 (b) 1 (c) 2 (d) 3
39	If a tangent to the curve $y^2 + 3x - 7 = 0$ at the point (h, k) is parallel to the line $x - y = 4$, then the value of ‘k’ is (a) $-\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{2}{3}$ (d) $-\frac{3}{2}$
40	The point on the curve $y^2 = x$, where tangent makes an angle of 45° with the x – axis is (a) $\left(\frac{1}{2}, \frac{1}{4}\right)$ (b) $\left(\frac{1}{4}, \frac{1}{2}\right)$ (c) (4, 2) (d) (2, – 2)
41	The line $y = x + 1$ is a tangent to the curve $y^2 = 4x$ at the point (a) (1, 2) (b) (2, 1) (c) (1, – 2) (d) (–1, 2)
42	The point (s) on the curve $y = x^3 - 11x + 5$ at which the tangent is $y = x - 11$ is/ are: (a) (– 2, 19) (b) (2, – 9) (c) (±2, 19) (d) (–2, 19) and (2, – 9)
43	The tangent to the curve $y = 2x^2 - x + 1$ is parallel to the line $y = 3x + 9$ at the point (a) (2, 3) (b) (2, – 1) (c) (2, 1) (d) (1, 2)

44 The points at which the tangents to the curve y = x^3 – 12x + 18 are parallel to x – axis are:

(a) (2, – 2), (– 2, – 34)	(b) (2, 34), (– 2, 0)
(c) (0, 34), (– 2, 0)	(d) (2, 2), (– 2, 34)

45 The points on the curve $\frac{x^2}{9}+\frac{y^2}{16}=1$ at which the tangents are parallel to y – axis are

(a) $(0, \pm 4)$	(b) $(\pm 4, 0)$
(c) $(\pm 3, 0)$	(d) $(0, \pm 3)$

46 The point at which the normal to the curve $y = x + \frac{1}{x}, x > 0$ is perpendicular to the line 3x – 4y – 7 = 0 is:

(a) $\left(2, \frac{5}{2}\right)$	(b) $\left(\pm 2, \frac{5}{2}\right)$
(c) $\left(-\frac{1}{2}, \frac{5}{2}\right)$	(d) $\left(\frac{1}{2}, \frac{5}{2}\right)$

47 The tangent to the curve y = e^{2x} at the point (0, 1) meets x – axis at

(a) (0, 1)	(b) $(-\frac{1}{2}, 0)$
(c) (2, 0)	(d) (0, 2)

48 The equation of the tangent to the curve y(1 + x^2) = 2 – x, where it cuts x – axis is:

(a) x + 5y = 2	(b) x – 5y = 2
(c) 5x – y = 2	(d) 5x + y = 2

49 The points on the curve 9y^2 = x^3, where normal to the curve marks equal intercepts with the axes are

(a) $\left(4, \pm \frac{8}{3}\right)$	(b) $\left(4, -\frac{8}{3}\right)$
(c) $\left(4, \pm \frac{3}{8}\right)$	(d) $\left(\pm 4, \frac{3}{8}\right)$

50 The angle between the tangents to the curve y = x^2 – 5x + 6 at the points (2, 0) and (3, 0) is

(a) $\frac{\pi}{6}$	(b) $\frac{\pi}{4}$
(c) $\frac{\pi}{3}$	(d) $\frac{\pi}{2}$

51 If the curve ay +x^2 = 7 and x^3 = y, cut orthogonally at (1, 1), then the value of 'a' i

(a)1	(b) 0
(c) – 6	(d) 6

52 If the curves y = 2e^x and y = ae^{-x} intersect orthogonally then a =

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

MAXIMA AND MINIMA

53 The function $f(x) = x^x$ has a stationary point at

(a) x = e	(b) x = $\frac{1}{e}$
(c) x = 1	(d) x = √e

54	At $x = \frac{5\pi}{6}$, f(x) = 2 sin3x + 3 cos3x is (a) Maximum (b) Minimum (c) Zero (d) Neither maximum nor minimum
55	The function f(x) = $2x^3 - 3x^2 - 12x + 4$, has (a) Two points of local maximum (b) Two points of local minimum (c) One maxima and one minima (d) No maxima or minima
56	Find all the points of local maxima and local minima of f(x) = $(x - 1)^3 (x + 1)^2$ (a) $1, -1, -\frac{1}{5}$ (b) 1, – 1 (c) $1, -\frac{1}{5}$ (d) $-1, -\frac{1}{5}$
57	Find the points at which f(x) = $(x - 2)^4 (x + 1)^3$ has points of inflection (a) x = – 1 (b) x = 1 (c) x = 2 (d) $x = \frac{1}{2}$
58	If x is real, the minimum value of $x^2 - 8x + 17$ is (a) – 1 (b) 0 (c) 1 (d) 2
59	The least value of the function $f(x) = ax + \frac{b}{x}$ (a > 0, b > 0, x > 0) is (a) $\sqrt{ab}$ (b) $2\sqrt{ab}$ (c) $\frac{\sqrt{ab}}{2}$ (d) ab
60	For all real x, the minimum value of $\frac{1-x+x^2}{1+x+x^2}$ is (a) 0 (b) 1 (c) 3 (d) $\frac{1}{3}$
61	The maximum value of $[x(x-1)+1]^{\frac{1}{3}}, 0 \le x \le 1$ is (a) $(3)^{\frac{1}{3}}$ (b) $\frac{1}{2}$ (c) 1 (d) 0
62	Find the maximum value of f(x) = sin(sinx) for all $x \in \Re$ (a) – sin 1 (b) sin 6 (c) sin 1 (d) – sin 3
63	The maximum value of sinx. cosx is (a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\sqrt{2}$ (d) $2\sqrt{2}$
64	The maximum value of $x^{\frac{1}{x}}, x > 0$ is (a) $e^{\frac{1}{e}}$ (b) $\left(\frac{1}{e}\right)^e$ (c) 1 (d) None
65	The maximum value of $\left(\frac{1}{x}\right)^x$ is: (a) e (b) e^e (c) $e^{\frac{1}{e}}$ (d) $(\frac{1}{e})^{\frac{1}{e}}$

66	The function $f(x) = \frac{logx}{x}$ has maximum at x =
	(a) $\frac{1}{e}$ / (b) e / (c) $-\frac{1}{e}$ / (d) – e
67	It is given that at x = 1, the function f(x) = $x^3 - 12x^2 + kx + 7$ attains maximum value, then the value of 'k'
	(a) 10 / (b) 12 / (c) 21 / (d) 13
68	The sum of two positive numbers is 14 and their sum is least, then the numbers are
	(a) 6, 7 / (b) 7, 7 / (c) 10, 4 / (d) 9, 5
69	Divide 20 into two parts such that the product of one part and the cube of the other is maximum. The two parts are
	(a) 10, 10 / (b) 12, 8 / (c) 15, 5 / (d) None of these
70	The area of a trapezium is defined by function f and given by $f(x) = (10 + x)\sqrt{100 - x^2}$, then the area when it is maximised is:
	(a) 75 cm^2 / (b) $7\sqrt{3}$ cm^2 / (c) $75\sqrt{3}$ cm^2 / (d) 5cm^2
71	The point on the curve $x^2 = 2y$ which is nearest to the point (0, 5)
	(a) $(2\sqrt{2}, 4)$ / (b) $(2\sqrt{2}, 0)$ / (c) (0, 0) / (d) (2, 2)
72	The smallest value of the polynomial $x^3 - 18x^2 + 96x$ in [0, 9] is
	(a) 126 / (b) 0 / (c) 135 / (d) 160
73	Let f(x) = $2x^3 - 3x^2 - 12x + 5$ on [– 2, 4]. The relative maximum occurs at x =
	(a) – 2 / (b) – 1 / (c) 2 / (d) 4
74	The absolute minimum value of the function f(x) = 2sinx in $\left[0, \frac{3\pi}{2}\right]$ is
	(a) – 2 / (b) 2 / (c) 1 / (d) – 1
75	The least value of the function f(x) = 2cosx + x in the closed interval $\left[0, \frac{\pi}{2}\right]$ is:
	(a) 2 / (b) $\frac{\pi}{6} + \sqrt{3}$ / (c) $\frac{\pi}{2}$ / (d) The least value does not exist

76	For what value of 'x' in the interval [0, π] does the function f(x) = sin2x attains the maximum value (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$
77	The maximum value of the slope of the curve $y = -x^3 + 3x^2 + 9x - 27$ is: (a) 0 (b) 12 (c) 16 (d) 32
78	The shortest distance between line y – x = 1 and curve $x = y^2$ is (a) $\frac{4}{\sqrt{3}}$ (b) $\frac{\sqrt{3}}{4}$ (c) $\frac{3\sqrt{2}}{8}$ (d) $\frac{8}{3\sqrt{2}}$
79	The function $f(x) = x + \frac{4}{x}$ has (a) A local maximum at x = 2 and local minima at x = – 2 (b) A local minimum at x = 2 and local maximum at x = – 2 (c) Absolute maxima at x = 2 and absolute minima at x = – 2 (d) Absolute minima at x = 2 and absolute maxima at x = – 2

Answers:

Q: 1	(b)	Q: 2	(b)	Q: 3	(b)	Q: 4	(b)	Q: 5	(d)
Q: 6	(b)	Q: 7	(d)	Q: 8	(a)	Q: 9	(a)	Q: 10	(b)
Q: 11	(a)	Q: 12	(a)	Q: 13	(a)	Q: 14	(b)	Q: 15	(b)
Q: 16	(a)	Q: 17	(c)	Q: 18	(c)	Q: 19	(a)	Q: 20	
Q: 21	(c)	Q: 22	(d)	Q: 23	(a)	Q: 24	(a)	Q: 25	(b)
Q: 26	(b)	Q: 27	(a)	Q: 28	(d)	Q: 29	(b)	Q: 30	(b)
Q: 31	(c)	Q: 32	(b)	Q: 33		Q: 34	(a)	Q: 35	(b)
Q: 36		Q: 37	(c)	Q: 38	(b)	Q: 39	(d)	Q: 40	(b)
Q: 41	(a)	Q: 42	(b)	Q: 43	(d)	Q: 44	(d)	Q: 45	(c)
Q: 46	(a)	Q: 47	(b)	Q: 48	(a)	Q: 49	(a)	Q: 50	(d)
Q: 51	(d)	Q: 52	(a)	Q: 53	(b)	Q: 54	(a)	Q: 55	(c)
Q: 56	(a)	Q: 57	(a)	Q: 58	(c)	Q: 59	(b)	Q: 60	(d)
Q: 61	(c)	Q: 62	(c)	Q: 63	(b)	Q: 64	(a)	Q: 65	(c)
Q: 66	(b)	Q: 67	(c)	Q: 68	(b)	Q: 69	(c)	Q: 70	(c)
Q: 71	(a)	Q: 72	(b)	Q: 73	(b)	Q: 74	(a)	Q: 75	(c)
Q: 76	(b)	Q: 77	(b)	Q: 78	(c)	Q: 79	(b)		

ASSERTION AND REASONING TYPE QUESTIONS

1) **Assertion (A)** : The function f(x) = $x^3 - 3x^2 + 6x - 100$ is strictly increasing on R

Reason (R) : A strictly increasing functions is an injective function.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

2) **Assertion (A)** : The function $y = [x(x-2)]^2$ is increasing in (0, 1) ∪ (2, ∞)

Reason (R) : $\frac{dy}{dx} = 0$, when x = 0, 1, 2.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

3) **Assertion** (A) : The function $y = \log(1+x) - \frac{2x}{2+x}$ is decreasing throughout its domain.

Reason (R) : The domain of the function $y = \log(1+x) - \frac{2x}{2+x}$ is (- 1, ∞).

A. Both A and R are true and R is the correct explanation oF A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

4) **Assertion (A):** $f(x) = \frac{1}{x-7}$ is decreasing $x \in \mathcal{R} - \{7\}$.

Reason(R) : $f^{'}(x) < 0, \forall x \neq 7.$

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

5) **Assertion (A)** : $f(x) = e^x$ is an increasing function, $\forall x \in \mathcal{R}$

Reason (R) : If $f^{'}(x) \leq 0$, then f(x) is an increasing function.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

6) **Assertion (A)** : Let $f(x) = e^{\frac{1}{x}}$ is defined for all real values of x.

Reason : $f(x) = e^{\frac{1}{x}}$ is always decreasing as $f^{'}(x) < 0$ in $x \in \mathcal{R}$

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

7) **Assertion (A)** : $f(x) = logx$ is defined for all x∈(0, ∞).

Reason (R) : If $f^{'}(x) > 0$, then f(x) is strictly increasing function.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true. E. Both A and R are false.

8) **Assertion (A)** : If $f(x) = \log(cosx)$, x > 0 is strictly decreasing in $\left(0, \frac{\pi}{2}\right)$.

Reason (R) : If $f^{'}(x) \geq 0$, then f(x) is strictlyincreasing function

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

9) **Assertion (A)** : If $f(x) = \log(sinx)$, x > 0 is strictly decreasing in $\left(\frac{\pi}{2}, \pi\right)$.

Reason (R) : If $f^{'}(x) \geq 0$, then f(x) is strictly increasing function

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true. E. Both A and R are false.

10) Consider the function f(x) = $\sin^4$x + $\cos^4$x.

Assertion (A): f(x) is increasing in $\left[0, \frac{\pi}{4}\right]$.

Reason (R): f(x) is decreasing in $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$.

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true. E. Both A and R are fal

11) **Assertion (A)** :If $f(x) = \tan^{-1}(sinx + cosx)$, x > 0 is always strictly increasing function in theinterval $x \in \left(0, \frac{\pi}{4}\right)$

Reason (R) : For the given function f(x), $f^{'}(x) > 0$if $x \in \left(0, \frac{\pi}{4}\right)$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

12) **Assertion (A)** : If $f(x) = \sin\left(2x + \frac{\pi}{4}\right)$ is strictly increasing in $x \in \left(\frac{3\pi}{8}, \frac{5\pi}{8}\right)$

Reason (R) : The function given above is strictly increasing and decreasing in $\left(\frac{3\pi}{8}, \frac{5\pi}{8}\right)$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

13) **Assertion (A)** : If $f(x) = \cos\left(2x + \frac{\pi}{4}\right)$ is strictly increasing in $x \in \left(\frac{3\pi}{8}, \frac{7\pi}{8}\right)$

Reason (R) : The function given above is strictly increasing in $\left(\frac{3\pi}{8}, \frac{7\pi}{8}\right)$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

14) **Assertion (A)** : If $f(x) = \mathrm{a}(\mathrm{x} + \sin\mathrm{x})$ is increasing function if a $\in (0, \infty)$

Reason (R) : The given function f(x) is increasing only if a $\in (0, \infty)$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

15) **Assertion (A)** :For all values of 'a', $f(x) = sinx - ax + b$ is decreasing on $x \in \mathcal{R}$.

Reason (R) :Given function f(x) is decreasing only if a ∈ $[1, \infty)$

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

16) **Assertion (A)** :For the curve $x^3 + y^3 = 6xy$, the slope of the tangent at (3, 3) is 2.

Reason (R) :The $\left(\frac{dy}{dx}\right)_{at\ (x_{1,}y_1)}$ gives slope of tangent of y = f(x) at (x_1, y_1).

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

17) **Assertion (A)** :There exists no tangent to the curve $= \sqrt{3x-2}$, which is parallel to the line
4x – 2y + 5 = 0.

Reason (R) **:** Tangent to the curve $y = \sqrt{3x-2}$exists at $\left(\frac{41}{48}, \frac{3}{4}\right)$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

18) **Assertion (A)** : There exists a unique tangent to the curve $y^2 + 3x - 7 = 0$ at the point (h, k) and is parallel to the line $x - y = 4$.

Reason (R) : The value of $k = -\frac{3}{2}$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

19) **Assertion (A)** : For the curve $y = \tan x$, the tangent and normal exists at a point (0, 0).

Reason (R) : Tangent and Normal lines are $x - y = 0$ and $x + y = 0$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

20) **Assertion (A)** :The curve $y = x^2$ represents a parabola with vertex at origin.

Reason (R) :For a curve Tangent and Normal lines are always perpendicular at thepoint of contact.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

21) **Assertion (A)** **:** Slope of the curve given as $y^2 = x$ at $x = 1$ not defined.

Reason (R) : Slope of the curve given as $y^2 = x$ at x = is $\pm\frac{1}{2}$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

22) **Assertion (A)** : At $x = \frac{\pi}{6}$, the curve $y = 2\cos^2(3x)$ has a vertical tangent.

Reason (R) : The slope of tangent to the curve $y = 2\cos^2(3x)$ at $x = \frac{\pi}{6}$ is zero.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

23) **Assertion (A)** : The equation of tangent to the curve $y = \sin x$ at the point (0, 0) is $y = x$.

Reason (R) : if $y = \sin x$, then $\frac{dy}{dx}$ at $x = 0$ is 1.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

24) **Assertion (A)** : The slope of normal to the curve $x^2 + 2y + y^2 = 0$ at (- 1, 2) is – 3.

Reason (R) : The slope of tangent to the curve $x^2 + 2y + y^2 = 0$ at (-1,

2) is $\frac{1}{3}$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

25) The equation of the tangent at (2, 3) on the curve $y^2 = ax^3 + b$ is $y = 4x – 5$.

Assertion (A) : The value of a is ±2

Reason (R) : The value of b is ±7.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

26) **Assertion (A)** :For all values of ‘t’ the tangent to the curve $x = t^2 – 1$, $y = t^2 – t$ isperpendicular tothe x – axis.

Reason (R) :For lines perpendicular to x – axis, their slopes will not defined always.

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

27) **Assertion (A)** : The points of contact of the vertical tangents to $x = 5 – 3 \cos\theta$, $y = 3 + 5 \sin\theta$ are (2, 3) and (8, 3).

Reason (R) :For vertical tangent $\frac{dx}{d\theta} = 0$.

A. Both A and R are true and R is the correct explanation ofr A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

28) **Assertion (A)** :he curves $x^3 – 3xy^2 = a$ and $3x^2y – y^3 = b$ cut each other, where 'a' and 'b' are some constants.

Reason (R) :The given curves cut orthogonally.

A. Both A and R are true and R is the correct explanation ofr A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

29) **Assertion (A)** :The curves $x^2 = y$ and $y^2 = x$ cut at $\frac{\pi}{2}$and $\tan^{-1}\left(\frac{3}{4}\right)$.

Reason (R) :Angle between two lines is given by $\tan\theta = \left|\frac{m_2-m_1}{1+m_1m_2}\right|$ where m_1 and m_2 are slopes of lines.

A. Both A and R are true and R is the correct explanation ofr A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

30) **Assertion (A)** :Equation of tangent at the point (2, 3) on the curve $y^2 = ax^3 + b$ is $y = 4x – 5$.

Reason (R) : Value of a = 2 and b = - 7.

A. Both A and R are true and R is the correct explanation ofr A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

31) **Assertion (A)** :Angle between the tangent lines $x^2 + y^2 = 1$ at the points (1, 0) and (0, 1) is $\frac{\pi}{2}$.

Reason (R) :Angle between two lines is given by $\tan\theta = \left|\frac{m_2 - m_1}{1 + m_1 m_2}\right|$ where m_1 and $m_2$are slopes oflines.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

32) **Assertion (A)** : Two curves $ax^2 + by^2 = 1$ and a'x2 + b'y_2 = 1 are orthogonal if $\frac{1}{a} - \frac{1}{b} = \frac{1}{a'} - \frac{1}{b'}$.

Reason (R) :Two curves intersect orthogonally at a point if product of their slopes at that point is – 1.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

33) **Assertion (A)** : For $f(x) = x + \frac{1}{x}, x \neq 0$, maximum and minimum values both exists.

Reason (R) : Maximum value of f(x) is less than its minimum value.

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.

D. A is false but R is true. E. Both A and R are false.
34) **Assertion (A)** : $f(x) = sin2x + 3$ is defined for all real values of x. **Reason (R)** : Minimum value of f(x) is 2 and Maximum value is 4.
A. Both A and R are true and R is the correct explanation of A B. Both A and R are true but R is NOT the correct explanation of A C. A is true but R is false. D. A is false but R is true. E. Both A and R are false.
35) **Assertion (A)** : $f(x) = \sin(sinx)$ is defined for all real values of x. **Reason (R)** : Minimum and minimum values does not exist.
A. Both A and R are true and R is the correct explanation of A B. Both A and R are true but R is NOT the correct explanation of A C. A is true but R is false. D. A is false but R is true. E. Both A and R are false.

36) **Assertion (A)** : $f(x) = -\|x + 1\| + 3$ is defined for all real values of x except x = - 1. **Reason (R)** : Maximum value of f(x) is 3 and Minimum value does not exist.
A. Both A and R are true and R is the correct explanation of A B. Both A and R are true but R is NOT the correct explanation of A C. A is true but R is false. D. A is false but R is true. E. Both A and R are false.
37) The Sum of surface areas (S) of a sphere of radius 'r' and a cuboid with sides $\frac{x}{3}$, x and 2x is a constant. **Assertion (A):** The sum of their volumes (V) is minimum when x equals three times the radius of the sphere.

Reason(R) : V is minimum when $r = \sqrt{\frac{S}{54+4\pi}}$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

38) AB is the diameter of a circle and C is any point on the circle.

Assertion (A) : The area of ∆ABC is maximum when it is isosceles.

Reason (R) : ∆ABC is a right – angled triangle.

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

39) A cylinder is inscribed in a sphere of radius R.

Assertion (A) : Height of the cylinder of maximum volume is $\frac{2R}{\sqrt{3}}$ units.

Reason (R) : The maximum volume of the cylinder is $\frac{4\pi R^3}{\sqrt{3}}$ cubic units.

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

40) **Assertion (A)** : The altitude of the cone of maximum volume that can be inscribed in a sphere of radius 'r' is $\frac{4r}{3}$.

Reason (R) :The maximum volume of the cone is $\frac{8}{27}$ of the volume of the sphere.

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

41) **Assertion (A):** Both sinx and cosx are decreasing functions in $\left(\frac{\pi}{2}, \pi\right)$

Reason (R): If a differentiable function decreases in (a, b), then its derivatives also decreases in (a, b).

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

42) **Assertion (A):** Let f: R →R be a function such that f(x) = $x^3 + x^2 + 3x$ + sinx. Then f is an increasingfunction.

Reason (R) :If $f^{'}(x_0) < 0$, then f(x) is decreasing function.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

43) **Assertion (A)** : The graph $y = x^3 + ax^2 + bx + c$ has extremum, if $a^2 < 3b$.

Reason (R) : A function, y = f(x) has an extremum, if $\frac{dy}{dx} < 0$ or $\frac{dy}{dx} > 0$ for all $x \in \mathcal{R}$.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

44) **Assertion (A):** If $f'(x) = (x-1)^3(x-2)^8$, then f(x) has neither maximum nor minimum at x = 2.

Reason (R) : $f'(x)$ changes sign from negative to positive at x = 2.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

45) Consider the function $f(x) = x^{\frac{1}{3}}$, $x \in \mathcal{R}$

Assertion (A) : f has a point of inflexion at x = 0.

Reason (R) : $f''(0) = 0$.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

46) **Assertion (A):** A window has the shape of a rectangle surmounted by an equilateral triangle. If theperimeter of the window is 12 m, then length 1.782 m and breadth 2.812 m of the rectanglewill produce the largest area of the window.

Reason (R) : For maximum or minimum $f'(x) = 0$.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

CASE STUDY

CS 1	A potter made a mud vessel, where the shape of the pot is based on f(x) = |x – 3| + | x-2|, where f(x) represents the height of the pot.		
1	When x > 4 What will be the height in terms of x ?		
	A. x – 2	B. x – 3	
	C. 2x – 5	D. 5 – 2x	
2	Will the slope vary with x value?		
	A. Yes	B. No	
	C. Can't Say	D. Data is not sufficient to say	
3	What is $\frac{dy}{dx}$ at x = 3		
	A. 2	B. – 2	
	C. Function is not differentiable	D. 1	
4	When the x value lies between (2,3) then the function is		
	A. 2x – 5	B. 5 – 2x	
	C. 1	D. 5	
5	If the potter is trying to make a pot using the function f(x) = [x] ,will he get a pot or not? Why?		
	A. Yes, because it is a continuous function	B. Yes, because it is not continuous	
	C. No, because it is not continuous	D. No, because it is not continuous	
CS 2	The shape of a toy is given as $f(x) = 6(2x^4 - x^2)$. To make the toy beautiful 2 sticks which are perpendicular to each other were placed at a point (2,3), above the toy.		
1	Which value from the following may be abscissa of critical point?		
	A. $\pm\frac{1}{4}$	B. $\pm\frac{1}{2}$	
	C. ± 1	D. None	
2	Find the slope of the normal based on the position of the stick.		
	A. 360	B. – 360	
	C. $\frac{1}{360}$	D. $-\frac{1}{360}$	

3 What will be the equation of the tangent at the critical point if it passes through (2,3)?

A. x + 360 y = 1082	B. y = 360 x – 717
C. x = 717 y + 360	D. None

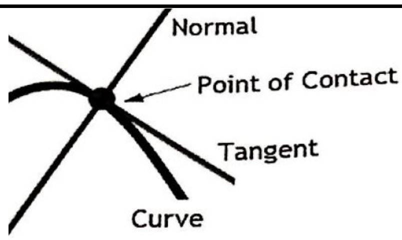
4 Find the second order derivative of the function at x = 5.

A. 598	B. 1176
C. 3588	D. 3312

5 At which of the following intervals will f(x) be increasing?

A. $\left(-\infty,-\frac{1}{2}\right)\cup\left(\frac{1}{2},\ \infty\right)$	B. $\left(-\frac{1}{2},0\right)\cup\left(\frac{1}{2},\ \infty\right)$
C. $\left(0,\frac{1}{2}\right)\cup\left(\frac{1}{2},\ \infty\right)$	D. $\left(-\infty,-\frac{1}{2}\right)\cup\left(0,\ \frac{1}{2}\right)$

CS 3 There is a toy in the form of a curve, whose equation is given by y = f(x). To make it a look more fancy, some straight sticks are crafted over it. Using derivatives, answer the following with reference to the curve $f(x) = (x – 3)^2$:



1 A student wants to draw a straight line which touches the parabolic curve given above at a specific point say (2, 1). The equation of this line is

A. 2x + y + 5 = 0	B. x + 2y = 5
C. 2x + y = 0	D. 2x + y = 5

2 Slope of the tangent to the parabolic curve given above at (3, 0) is

A. 0	B. 1
C. 2	D. -1

3 The normal to the curve $y = (x – 3)^2$ at (3, 0) is

A. Parallel to x – axis	B. Parallel to y – axis
C. Perpendicular to y – axis	D.Can not be determine.

4 The point on the given curve $y = (x – 3)^2$, where the tangent is parallel to the line joining the points (4, 1) and (3, 0) is

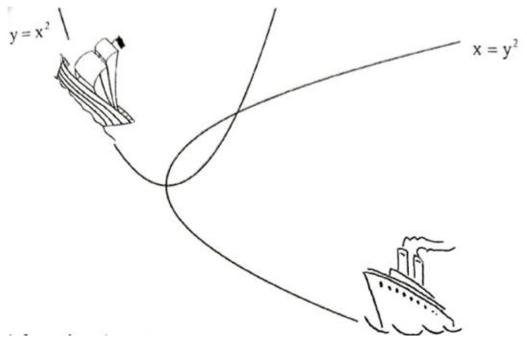
A. (1, 7)	B. $\left(\frac{7}{2},\frac{1}{4}\right)$
C. (- 7, 1)	D. (7, 4)

5 The product of slopes of tangent and normal to the given curve, at (2, 1) is

A. 0	B. 1
C. – 1	D. 2

CS 4

Assuming that two ships follow the path of curves C_1: $y = x^2$ and C_2: $x = y^2$ in the sea. There are high chances that these ships may cross the path traced by each other.



1 The points of intersection for the path traced by the ships (intersection of curves) are

A. (0, 0), (1, ±1)	B. (0, 0), (±1, 1)
C. (0, - 1), (1, 0)	D.(1, 0), (0, 1)

2 What are the number of points at which the given two curves intersect?

A. 2	B. 1
C. 3	D. 0

3 The slope of the curve $x = y^2$ at the point of intersection of both the given curves is

A. $\frac{1}{2}, -\frac{1}{2}, \frac{1}{0}(not\ defined)$	B. $\frac{1}{2}, 0$
C. $-\frac{1}{2}, \frac{1}{0}(not\ defined)$	D. $\frac{1}{2}, \frac{1}{0}(not\ defined)$

4 The slope of tangent to the curve $y = x^2$ at the point of intersection of both the given curves, is

A. 0, 2	B. 2, - 2
C. 0, - 1	D. 2, - 2, 0

5 The angle of intersection of both the curves is

A. $\pi, \tan^{-1}\frac{3}{4}$	B. $\frac{\pi}{2}, \tan^{-1}\frac{4}{3}$
C. $\frac{\pi}{2}, \tan^{-1}\frac{3}{4}$	D. $-\frac{\pi}{2}, \tan^{-1}\frac{3}{4}$

CS 5

$P(x) = -5x^2 + 125x + 37500$ is the total profit function of a company, where x is the production of the company.

1 What will be the production when the profit is maximum?

A. 37500	B. 12.5
C. – 12.5	D. – 37500

2 What will be the maximum profit?

A. Rs.38,28,125	B. Rs.38281.25
C. Rs.39,000	D. None

3 Check in which interval the profit is strictly increasing.

A. (12.5, ∞)	B. For all real numbers
C. For all positive real numbers	D. (0, 12.5)

4 When the production is 2units what will be the profit of the company?

A. 37500	B. 37,730
C. 37,770	D. None

5 What will be production of the company when the profit is Rs. 38,250?

A. 15	B. 30
C. 2	D. Data is not sufficient to find

CS 6 The Relation between the height of the plant (y in cm) with respect to exposure to sunlight is governed by the following equation $y = 4x - \frac{1}{2}x^2$ where x is the number of days exposed to sunlight.

1 The rate of growth of the plant with respect to sunlight is _______ .

A. $4x - \frac{1}{2}x^2$	B. $4 - x$
C. $x - 4$	D. $x - \frac{1}{2}x^2$

2 What is the number of days it will take for the plant to grow to the maximum height?

A. 4	B. 6
C. 7	D. 10

3 What is the maximum height of the plant?

A. 12 cm	B. 10 cm
C. 8 cm	D. 6 cm

4 What will be the height of the plant after 2 days?

A. 4 cm	B. 6 cm
C. 8 cm	D. 10 cm

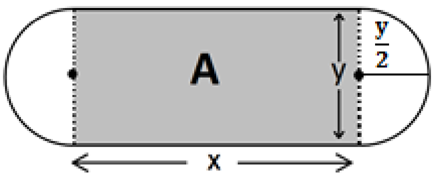
5 If the height of the plant is $\frac{7}{2}$ cm, the number of days it has been exposed to the sunlight is

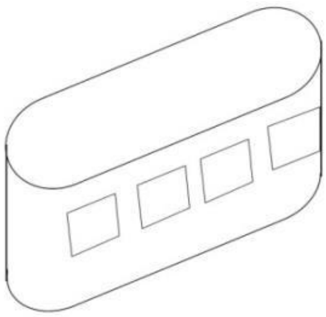
A. 2	B. 3
C. 4	D. 1

CS 7 An architect designs a building for a multi-national company. The floor consists of a rectangular region with semicircular ends having a perimeter of 200m as shown below:

Design of Floor

Building





Based on the above information answer the following:

1 If x and y represent the length and breadth of the rectangular region, then the relation between the variables is

A. x + π y = 100	B. 2x + π y = 200
C. π x + y = 50	D.x + y = 100

2 The area of the rectangular region A expressed as a function of x is

A. $\frac{2}{\pi}(100x - x^2)$	B. $\frac{1}{\pi}(100x - x^2)$
C. $\frac{x}{\pi}(100 - x)$	D. $\pi y^2 + \frac{2}{\pi}(100x - x^2)$

3 The maximum value of area A is

A. $\frac{\pi}{3200} m^2$	B. $\frac{3200}{\pi} m^2$
C. $\frac{5000}{\pi} m^2$	D. $\frac{1000}{\pi} m^2$

4 The CEO of the multi-national company is interested in maximizing the area of the whole floor including the semi-circular ends. For this to happen the valve of x should be

A. 0 m	B. 30 m
C. 50 m	D. 80 m

5 The extra area generated if the area of the whole floor is maximized is :

A. $\frac{3000}{\pi} m^2$	B. $\frac{5000}{\pi} m^2$
C. $\frac{7000}{\pi} m^2$	D. No change. Both areas are equal

CS 8

Sonam wants to prepare a sweet box for Diwali at home. For making lower part of box, she takes a square piece of card board of side 18cm. based on the above information, answer the following questions.

Based on the above information, Answer the following questions.

1 If x cm be the length of each side of the square cardboard which is to be cut off from corner of the square piece of side 18 cm, then x must lie in

A. [0, 18]	B. (0, 9)
C. (0, 3)	D. None of these.

2 Volume of the open box formed by folding up the cutting corner can be expressed as

A. $V = x(18 - 2x)(18 - 2x)$	B. $V = \frac{x}{2}(18 + x)(18 - x)$
C. $V = \frac{x}{3}(18 - 2x)(18 + 2x)$	D. $V = x(18 - 2x)(18 - x)$

3	The values of x for which $\frac{dV}{dx} = 0$, are A. 3, 2 — B. 0, 3 C. 0, 9 — D. 3, 9
4	Sonam is interested in maximizing the volume of the box. So, what should be the side of the square to be cut off so that the volume of the box is maximum? A. 13 cm — B. 8 cm C. 3 cm — D. 2 cm
5	The maximum value of the volume is A. 144 cm^3 — B. 232 cm^3 C. 256 cm^3 — D. 432 cm^3

ANSWERS:

1.B	2.B	3.D	4.A	5.C	6.A	7.A	8.B	9.D	10.B
11.A	12.C	13.A	14.D	15.D	16.A	17.A	18.A	19.A	20.B
21.D	22.D	23.A	24.A	25.C	26.D	27.A	28.A	29.A	30.A
31.A	32.A	33.A	34.A	35.C	36.D	37.A	38.A	39.C	40.B
41.C	42.B	43.A	44.C	45.C	46.A				

CASE STUDY:

Case Study-1	1.C	2.A	3.C	4.C	5.D
Case Study-2	1.B	2.D	3.B	4.C	5.B
Case Study-3	1.D	2.A	3.B	4.B	5.C
Case Study-4	1.B	2.C	3.D	4.D	5.C
Case Study-5	1.B	2.B	3.D	4.B	5. A
Case Study-6.	1.B	2.A	3.C	4.B	5.D
Case Study-7.	1.B	2.A	3.C	4.A	5.D
Case Study-8.	1.B	2.A	3.D	4.C	5.D

LINEAR PROGRAMMING

MULTIPLE CHOICE QUESTIONS

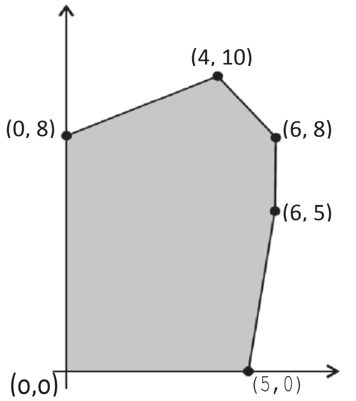
1 The corner points of the feasible region determinedby the system of linear constraints are (0, 0), (0,40), (20,40),(60,20),(60,0).The objectivefunction is

Compare the quantity in Column A and Column *B*

Column A	Column *B*
Maximum of Z	325

(a) The quantity in column A is greater	(b)The quantity in column *B* is greater
(c) The two quantities are equal.	(d) The relationship cannot be determined on the basis of the information supplied.

2 The feasible solution for a LPP is shown in given figure. Let Z=3x-4y be the objective function. Minimum of Z occurs at



(a) (0,0)	(b) (0,8)
(c) (5,0)	(d) (4,10)

3 Corner points of the feasible region determined by the system of linear constraints are (0,3),(1,1) and (3,0). Let Z= px+qy, where p, q>0. Condition on p and q so that the minimum of Z occurs at (3,0) and (1,1) is

(a) p=2q	(b) p=q/2
(c) p=3q	(d) p=q

4 The set of all feasible solutions of a LPP is a ____ set.

(a) Concave	(b) Convex
(c) Feasible	(d) None of these

5 Corner points of the feasible region for an LPP are (0,2), (3,0), (6,0), (6,8) and (0,5). Let F=4x+6y be the objective function. Maximum of F – Minimum of F =

(a) 60	(b) 48
(c) 42	(d) 18

6 In a LPP, if the objective function Z = ax+by has the same maximum value on two corner points of the feasible region, then every point on the line segment joining these two points give the same……….value.

(a) minimum	(b) maximum
(c) zero	(d) none of these

7 In the feasible region for a LPP is ………, then the optimal value of the objective function Z = ax+bymayormaynot exist.

(a) bounded	(b) unbounded
(c) in circled form	(d) in squared form

8 A linear programming problem is one that is concerned with finding the …A … of a linear function called …B… function of several values (say x and y), subject to the conditions that the variables are …C… and satisfy set of linear inequalities called linear constraints.

(a) Objective, optimal value, negative	(b) Optimal value, objective, negative
(c) Optimal value, objective, non-negative	(d) Objective, optimal value, non-negative

9 Maximum value of the objective function Z = ax+by in a LPP always occurs at only one corner point of the feasible region.

(a) true	(b) false
(c) can't say	(d) partially true

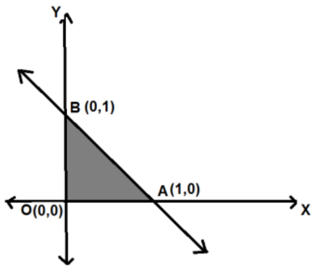
10 Region represented by $x \geq 0, y \geq 0$ is:

(a) First quadrant	(b) Second quadrant
(c) Third quadrant	(d) Fourth quadrant

11 Z =3x + 4y,

Subject to the constraints x+y 1, $x, y \geq 0$.

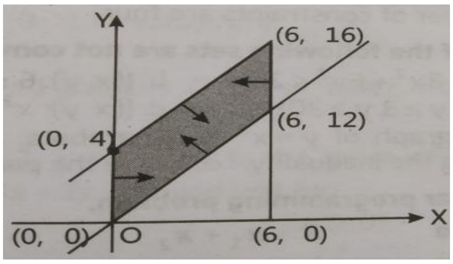
the shaded region shown in the figure as OAB is bounded and thecoordinatesof corner points O, A and B are (0,0),(1,0) and (0,1), respectively.



The maximum value of Z is 2.

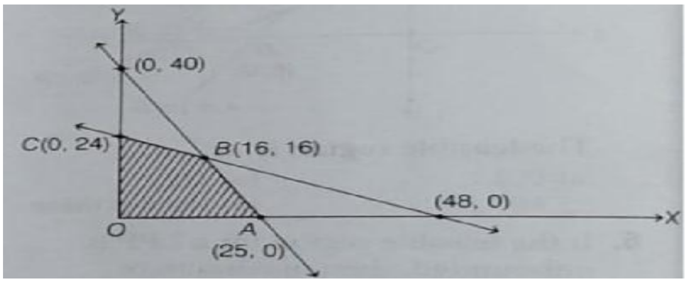
(a) true	(b) false
(c) can't say	(d) partially true

12 The feasible region for an LPP is shown shaded in the figure. Let Z = 3x-4y be objective function. Maximum value of Z is:



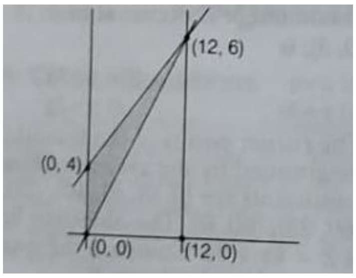
(a) 0	(b) 8
(c) 12	(d) -18

13 The maximum value of Z = 4x+3y, if the feasible region for an LPP is as shown below, is



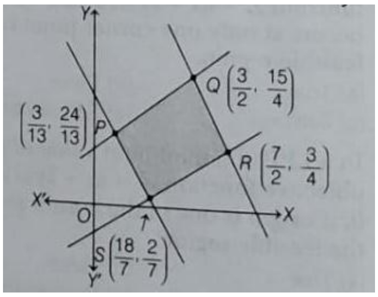
(a) 112	(b) 100
(c) 72	(d) 110

14 The feasible region for an LPP is shown shaded in the figure. Let Z = 4x-3y be objective function. Maximum value of Z is:



(a) 0	(b) 8
(c) 30	(d) -18

15 In the given figure, the feasible region for a LPP is shown. Find the maximum and minimum value of Z = x+2y.



(a) 8, 3.2	(b) 9, 3.14
(c) 9, 4	(d) none of these

16 The linear programming problem minimize Z= 3x+2y,subject to constraints x+y8, 3x+5y 15, x,y ≥0, has

(a) One solution	(b) No feasible solution
(c) Two solutions	(d) Infinitely many solutions

17 The graph of the inequality 2x+3y > 6 is:

(a) half plane that contains the origin	(b) half plane that neither contains the origin nor the points of the line 2x+3y =6
(c) whole XOY-plane excluding the points on the line 2x+3y =6	(d) entire XOY-plane

18 Of all the points of the feasible region for maximum or minimum of objective function the points

(a) Inside the feasible region	(b) At the boundary line of the feasible region
(c) Vertex point of the boundary of the feasible region	(d) None of these

19 The maximum value of the object function Z = 5x + 10 y subject to the constraints x + 2y ≤ 120, x + y ≥ 60, x – 2y ≥ 0, x ≥ 0, y ≥ 0 is

(a) 300	(b) 600
(c) 400	(d) 800

20 Z = 6x + 21 y, subject to x + 2y ≥ 3, x + 4y ≥ 4, 3x + y ≥ 3, x ≥ 0, y ≥ 0. The minimum value of Z occurs at

(a) (4, 0)	(b) (28, 8)
(c) (2,2/7)	(d) (0, 3)

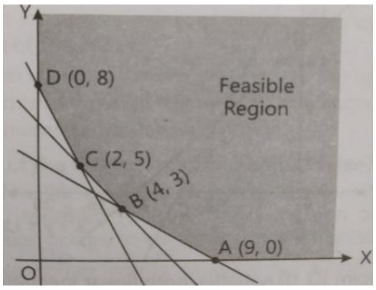
21 Shape of the feasible region formed by the following constraints x + y ≤ 2, x + y ≥ 5, x ≥ 0, y ≥ 0

(a) No feasible region	(b) Triangular region
(c) Unbounded solution	(d) Trapezium

22 Maximize Z = 4x + 6y, subject to 3x + 2y ≤ 12, x + y ≥ 4, x, y ≥ 0.

(a) 16 at (4, 0)	(b) 24 at (0, 4)
(c) 24 at (6, 0)	(d) 36 at (0, 6)

23	Feasible region for an LPP shown shaded in the following figure. Minimum of Z = 4x+3y occurs at the point:



(a) (0,8)	(b) (2,5)
(c) (4,3)	(d) (9,0)

24	The region represented by the inequalities $x \geq 6, y \geq 2, 2x + y \leq 0, x \geq 0, y \geq 0$ is

(a) unbounded	(b) a polygon
(c) exterior of a triangle	(d) None of these

25	Minimize $Z = 13x - 15y$ subject to the constraints : $x + y \leq 7$, $2x - 3y + 6 \geq 0$, $x \geq 0$, $y \geq 0$.

(a) -23	(b) -32
(c) -30	(d) -34

Answer Key:-

Q: 1	b	Q: 2	b	Q: 3	b	Q: 4	a	Q: 5	a
Q: 6	b	Q: 7	b	Q: 8	c	Q: 9	b	Q: 10	a
Q: 11	b	Q: 12	a	Q: 13	a	Q: 14	c	Q: 15	b
Q: 16	b	Q: 17	b	Q: 18	c	Q: 19	b	Q: 20	c
Q: 21	a	Q: 22	d	Q: 23	b	Q: 24	d	Q: 25	c

ASSERTION AND REASONING TYPE QUESTIONS

1. **Assertion (A):** Feasible region is the set of points which satisfy all of the given constraints.

Reason (R): The optimal value of the objective function is attained at the points on X-axisonly.

A. Both A and R are true and R is the correct explanation ofr A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.

E. Both A and R are false.

2. **Assertion (A):** It is necessary to find objective function value at every point in the feasible region to find optimum value of the objective function.

Reason(R): For the constrains $2x+3y\leq 6$, $5x+3y\leq 15$, $x\geq 0$ and $y\geq 0$ cornner points of the feasible region are (0,2), (0,0) and (3,0).

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

3. **Assertion (A):** It is necessary to find objective function value at every point in the feasible region to find optimum value of the objective function.

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A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

4. **Assertion (A)** : For the constraints of linear optimizing function $Z = x_1 + x_2$ given by $x_1 + x_2 \leq 1$, $3x_1 + x_2 \geq 1$, $x\geq 0$ and $y\geq 0$ there is no feasible region.

Reason (R): $Z = 7x + y$, subject to $5x + y \leq 5$, $x + y \geq 3$, $x \geq 0$, $y \geq 0$. The corner points of the feasible region are $\left(\frac{1}{2}, \frac{5}{2}\right)$ $(0,3)$ and $(0,5)$.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

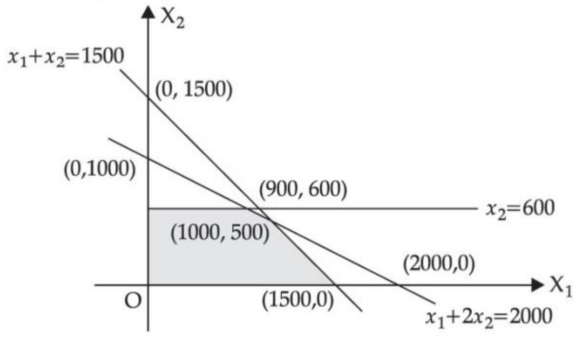
C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

5. **Assertion (A):** For the constraints of a LPP problem given by $x_1 + 2x_2 \leq 2000$, $x_1 + x_2 \leq 1500$, $x_2 \leq 600$ and $x_1, x_2 \geq 0$ the points (1000, 0), (0, 500), (2, 0) lie in the positive bounded region, but point (2000, 0) does not lie in the positive boundedregion.

Reason (R):



A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

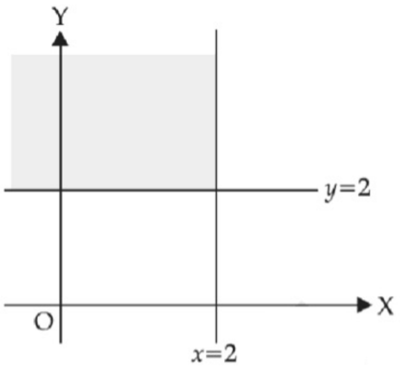
C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

6. **Assertion (A):** The graph of $x \leq 2$ and $y \geq 2$ will be situated in the first and second quadrants.

Reason (R):



A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

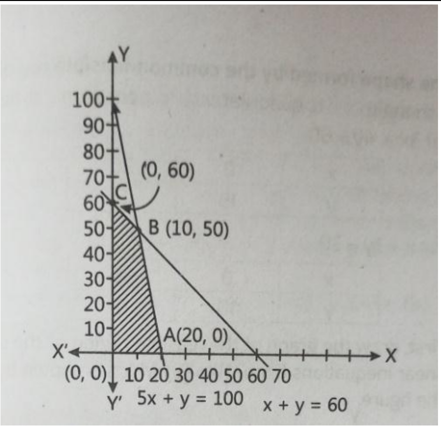
7. **Assertion (A):** The maximum value of $Z = 11x+7y$
Subject to the constraints are
$2x+y \leq 6$,
$x \leq 2$,
$x,y \geq 0$.
Occurs at the point (0,6).
Reason (R): If the feasible region of the given LPP is bounded, then the maximum and minimum values of the objective function occurs at corner points.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

8. **Assertion (A):** If an LPP attains its maximum value at two corner points of the feasible region then it attains maximum value at infinitely many points.
Reason (R): if the value of the objective function of a LPP is same at two corners then it is same at every point on the line joining two corner points.

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is NOT the correct explanation of A
C. A is true but R is false.
D. A is false but R is true.
E. Both A and R are false.

9. Consider, the graph of constraints stated as linear inequalities as below:
$5x+y \leq 100$,
$x+y \leq 60$,
$x,y \geq 0$.



Assertion (A): The points (10,50), (0,60) , (10,10) and (20,0) are feasible solutions.

Reason (R): Points within and on the boundary of the feasible region represent feasible solutions of the constraints.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

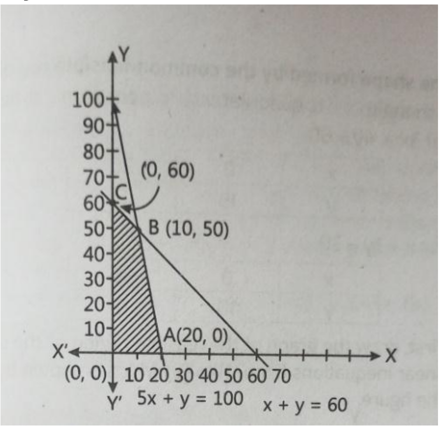
E. Both A and R are false.

10. Consider, the graph of constraints stated as linear inequalities as below:

$5x+y\leq100$,

$x+y\leq60$,

$x,y\geq0$.



Assertion (A): (25,40) is an infeasible solution of the problem.

Reason (R): Any point inside the feasible region is called an infeasible solution.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

11. **Assertion (A):** The region represented by the set $\{(x,y): 4 \le x^2+y^2 \le 9\}$ is a convex set.

Reason (R): The set $\{(x,y): 4 \le x^2+y^2 \le 9\}$ represents the region between two concentric circles of radii 2 and 3.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

12. **Assertion (A):** For an objective function Z= 15x + 20y, corner points are (0,0), (10,0), (0,15) and (5,5). Then optimal values are 300 and 0 respectively.

Reason (R): The maximum or minimum value of an objective function is known as optimal value of LPP. These values are obtained at corner points.

A. Both A and R are true and R is the correct explanation ofr A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

13. **Assertion (A): For the LPP** Z= 3x+2y, subject to the constraints $x+2y \le 2$; $x \ge 0$; $y \ge 0$ both maximum value of Z and Minimum value of Z can be obtained.

Reason (R): If the feasible region is bounded then both maximum and minimum values of Z exists.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

14. **Assertion (A):** The linear programming problem, maximize Z = x+2y subject to constraints $x-y \leq 10, 2x + 3y \leq 20$ and $x \geq 0$; $y \geq 0$. It gives the maximum value of Z as 40/3.

Reason (R): To obtain maximum value of Z, we need to compare value of Z at all the corner points of the shaded region.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

15. **Assertion (A):** Consider the linear programming problem. Maximise $Z=4x+y$ Subject to constraints $x+ y \leq 50$; $x+ y \geq 100$ and $x, y \geq 0$. Then, maximum value of Z is 50.

Reason (R): If the shaded region is bounded then maximum value of objective function can be determined.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

E. Both A and R are false.

CASE STUDY

CS 1

A train can carry a maximum of 300 passengers. A profit of Rs. 800 is made on each executive class and Rs. 200 is made on each economy class. The IRCTC reserves at least 40 tickets for executive class. However, atleast 3 times as many passengers prefer to travel by economy class, than by executive class. It is given that the number of executive class ticket is Rs. x and that of economy class ticket is Rs. y.
Optimize the given problem.

Based on the above information, answer the following questions.

1 The objective function of the LPP is:

(a) Maximise $Z = 800x + 200y$	(b) Maximise $Z = 200x + 800y$
(c) Minimise $Z = 800x + 200y$	(d) Minimise $Z = 200x + 800y$

2 Which among these is a constraint for this LPP?

(a) $x+y\geq 300$	(b) $y\geq 3x$
(c) $x\leq 40$	(d) $y\leq 3x$

3 Which among these is not a corner point for this LPP?

(a) (40,120)	(b) (40, 260)
(c) (30, 90)	(d) (75, 225)

4 The maximum profit is:

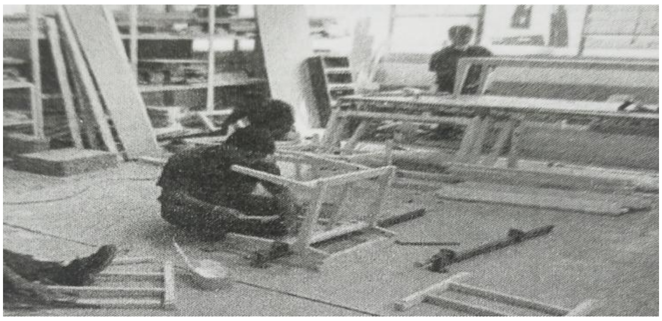
(a) Rs.56000	(b) Rs. 84000
(c) Rs. 205000	(d) Rs. 105000

5 Which corner point the objective function has minimum value?

(a) (40,120)	(b) (40, 260)
(c) (30, 90)	(d) (75, 225)

CS 2

A manufacturing company makes two models X and Y of a product. Each piece of

	model X requires 9 labour hours for fabricating and 1 labour hour for finishing. Each piece of model Y requires 12 labour hours of fabricating and 3 labour hours for finishing, the maximum labour hours available for fabricating and finishing are 180 and 30 respectively. The company makes a profit of Rs. 8000 on each piece of model X and Rs. 12000 on each piece of model Y. Assume x is the number of pieces of model X and y is the number of pieces of model Y.  Based on the above information, answer the following questions.
1	Which among these is not a constraint for this LPP?
2	The shape formed by the common feasible region is:
3	Which among these is a corner point for this LPP?
4	Maximum of Z occurs at
5	The sum of maximum value of Z is:

1 Which among these is not a constraint for this LPP?

(a) $9x+12y \geq 180$	(b) $3x+4y \leq 60$
(c) $x+3y \leq 30$	(d) None of these

2 The shape formed by the common feasible region is:

(a) Triangle	(b) Quadrilateral
(c) Pentagon	(d) hexagon

3 Which among these is a corner point for this LPP?

(a) (0,20)	(b) (6,12)
(c) (12,6)	(c) (10,0)

4 Maximum of Z occurs at

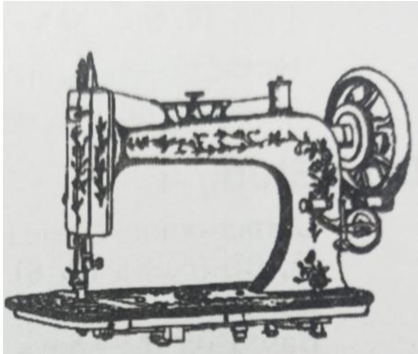
(a) (0,20)	(b) (0,10)
(c) (20,10)	(d) (12,6)

5 The sum of maximum value of Z is:

(a) 168000	(b) 160000
(c) 120000	(d) 180000

CS 3

Suppose a dealer in rural area wishes to purchase a number of sewing machines. He has only Rs. 5760 to invest and has space for atmost 20 items for storage. An electronic sewing machine costs him Rs. 360 and a manually operated sewing machine Rs. 240. He can sell an electronic sewing machine at a profit of Rs. 22 and a manually operated sewing machine at a profit of Rs.18.
Based on the above information, answer the following questions.



1 Let x and y denote the number of electronic sewing machines and manually operated sewing machines purchased by the dealer. If it is assumed that the dealer purchased atleast one of the given machines then:

(a) x+y≥ 0	(b) x+y< 0
(c) x+y> 0	(c) x+y≤ 0

2 Let the constraints in the given problem is represented by the following inequalities:
x+y≤20; 360x+240y≤5760 and x,y≥0. Then which of the following point lie in its feasible region.

(a) (0,24)	(b) (8,12)
(c) (20,2)	(d) None of these

3 If the objective function of the given problem is maximize Z = 22x+18y, then its optimal value occur at:

(a) (0,0)	(b) (16,0)
(c) (8,12)	(d) (0,2)

4 Suppose the following shaded region APDO, represent the feasible region corresponding to mathematical formulation of the given problem.
Then which of the following represent the coordinates of one of its corner points.

(a) (0,24)	(b) (12,8)
(c) (8,12)	(d) (6,14)

5 If an LPP admits optimal solution at two consecutive vertices of a feasible region, then

(a) The required optimal solution is at a mid pointof the line joining two points.	(b) The optimal solution occurs at every point on the line joining these two points.
(c) The LPP under consideration is not solvable.	(d) The LPP under consideration must be reconstructed.

ANSWERS:

ASSERTION AND REASONING

1	C	2	D	3	D	4	A	5	A
6	A	7	A	8	A	9	A	10	C
11	D	12	A	13	A	14	A	15	D

CASE STUDY

CS-1	1) A	2) B	3) C	4) D	5) A
CS-2	I) A	2) B	3) C	4) D	5) A
CS-3	I)C	2) B	3) C	4) C	5) B