पी एम श्री केन्द्रीय विद्यालय गच्चीबौली हैदराबाद

PM SHRI KENDRIYA VIDYALAYA GACHIBOWLI HYDERABAD

2023-2024

Maths CLASS XII Chapter Wise Practice papers

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PRACTICE PAPER 01 (2023-24)

CHAPTER 01 RELATIONS AND FUNCTIONS

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : XII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The relation R in the set of real numbers defined as $R = \{(a, b) \in R \times R : 1 + ab > 0\}$ is
(*a*) reflexive and transitive (*b*) symmetric and transitive
(*c*) reflexive and symmetric (*d*) equivalence relation

2. Let the function 'f' be defined by $f(x) = 5x^2 + 2, \forall x \in R$. Then '$f$' is
(*a*) onto function (*b*) one-one, onto function
(*c*) one-one, into function (*d*) many-one, into function

3. Let set X = {1, 2, 3} and a relation R is defined in X as : R = {(1, 3), (2, 2), (3, 2)}, then minimum ordered pairs which should be added in relation R to make it reflexive and symmetric are
(a) {(1, 1), (2, 3), (1, 2)} (b) {(3, 3), (3, 1), (1, 2)}
(c) {(1, 1), (3, 3), (3, 1), (2, 3)} (d) {(1, 1), (3, 3), (3, 1), (1, 2)}

4. Let Z be the set of integers and R be a relation defined in Z such that aRb if (a – b) is divisible by 5. Then number of equivalence classes are
(a) 2 (b) 3 (c) 4 (d) 5

5. Let R be a relation defined as R = {(x, x), (y, y), (z, z), (x, z)} in set A = {x, y, z} then relation R is
(a) reflexive (b) symmetric (c) transitive (d) equivalence

6. If R = {(x, y) : x + 2y = 8} is a relation on N, then range of R is
(a) {3} (b) {1, 2, 3} (c) {1, 2, 3, ... 8} (d) {1, 2}

7. Let A = {a, b, c}, then the total number of distinct relations in set A are
(a) 64 (b) 32 (c) 256 (d) 512

8. Let $X = \{x^2 : x \in N\}$ and the function $f : N \to X$ is defined by $f(x) = x^2, x \in N$. Then this function is
(a) injective only (b) not bijective (c) surjective only (d) bijective

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.

(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.

9. Assertion (A): In set A = {1, 2, 3} a relation R defined as R = {(1, 1), (2, 2)} is reflexive.
Reason (R): A relation R is reflexive in set A if $(a, a) \in R$ for all $a \in A$.

10. Assertion (*A*): In set $A = \{a, b, c\}$ relation R in set A, given as $R = \{(a, c)\}$ is transitive.
Reason (*R*): A singleton relation is transitive.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Show that the relation R in the set {1, 2, 3} given by R = {(1,1), (2, 2), (3, 3), (1, 2), (2, 3)} is reflexive but neither symmetric nor transitive.

12. Prove that the Greatest Integer Function $f : R \to R$, given by $f(x) = [x]$ is neither one-one nor onto. Where [x] denotes the greatest integer less than or equal to x.

13. Let $A = \{1, 2, 3\}$, $B = \{4, 5, 6, 7\}$ and let $f = \{(1, 4), (2, 5), (3, 6)\}$ be a function from A to B. Show that f is one-one.

14. Let the function $f : R \to R$ be defined by $f(x) = \cos x \ \forall x \in R$. Show that f is neither one-one nor onto.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Let T be the set of all triangles in a plane with R a relation in T given by $R = \{(T_1, T_2) : T_1 \cong T_2\}$. Show that R is an equivalence relation.

16. Show that the relation S in the set R of real numbers, defined as $S = \{(a, b) : a, b \in R \text{ and } a \leq b^3\}$ is neither reflexive, nor symmetric, nor transitive.

17. Show that the function $f : R \to R$ defined by $f(x) = \dfrac{x}{x^2+1}, \ \forall x \in R$ is neither one-one nor onto.

SECTION – D

Questions 18 carry 5 marks.

18. Let N denote the set of all natural numbers and R be the relation on $N \times N$ defined by $(a, b) \ R \ (c, d)$ if $ad(b + c) = bc(a + d)$. Show that R is an equivalence relation.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Sherlin and Danju are playing Ludo at home during Covid-19. While rolling the dice, Sherlin's sister Raji observed and noted that possible outcomes of the throw every time belongs to set {1, 2, 3, 4, 5, 6}. Let A be the set of players while B be the set of all possible outcomes.

$A = \{S, D\}$, $B = \{1, 2, 3, 4, 5, 6\}$

(*i*) Let $R : B \to B$ be defined by $R = \{(x, y) : y \text{ is divisible by } x\}$. Show that relation R is reflexive and transitive but not symmetric.

(*ii*) 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 check whether R is an equivalence relation.

(*iii*) Raji wants to know the number of functions from A to B. How many number of functions are possible?

OR

(iii) Raji wants to know the number of relations possible from A to B. How many numbers of relations are possible?

20. A general election of Lok Sabha is a gigantic exercise. About 911 million people were eligible to vote and voter turnout was about 67%, the highest ever

Let I be the set of all citizens of India who were eligible to exercise their voting right in general election held in 2019. A relation 'R' is defined on I as follows:

$R = \{(V_1, V_2) : V_1, V_2 \in I$ and both use their voting right in general election – 2019$\}$

(*i*) Two neighbours X and $Y \in I$. X exercised his voting right while Y did not cast her vote in general election-2019. Check whether X is related to Y or not.

(*ii*) Mr. 'X' and his wife 'W' both exercised their voting right in general election-2019. Show that $(X, W) \in R$ and $(W, X) \in R$.

(*iii*) Three friends F_1, F_2 and F_3 exercised their voting right in general election-2019. Show that $(F_1, F_2) \in R$, $(F_2, F_3) \in R$ and $(F_1, F_3) \in R$.

OR

Show that the relation R defined on set I is an equivalence relation.

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PRACTICE PAPER 02 (2023-24)
CHAPTER 02 INVERSE TRIGONOMETRIC FUNCTIONS

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : XII **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. The value of $\tan^{-1}(\sqrt{3})+\cos^{-1}\left(-\frac{1}{2}\right)$ corresponding to principal branches is

(a) $-\frac{\pi}{12}$ (b) 0 (c) π (d) $\frac{\pi}{3}$

2. The value of $\sin^{-1}\left(\cos\frac{\pi}{9}\right)$ is

(a) $\frac{\pi}{9}$ (b) $\frac{5\pi}{9}$ (c) $\frac{-5\pi}{9}$ (d) $\frac{7\pi}{18}$

3. The domain of the function defined by $\sin^{-1}\sqrt{x-1}$ is
(a) [1, 2] (b) [–1, 1] (c) [0, 1] (d) none of these

4. The value of $\tan^2(\sec^{-1}2) + \cot^2(\text{cosec}^{-1}3)$ is
(a) 5 (b) 11 (c) 13 (d) 15

5. The value of $\tan^{-1}\left(\sin^{-1}\frac{3}{5}+\tan^{-1}\frac{3}{4}\right)$ is

(a) $\frac{7}{24}$ (b) $\frac{24}{7}$ (c) $\frac{3}{2}$ (d) $\frac{3}{4}$

6. If $\alpha \le 2\sin^{-1}x+\cos^{-1}x \le \beta$,then

(a) $\alpha=\frac{-\pi}{2},\beta=\frac{\pi}{2}$ (b) $\alpha=0,\beta=\pi$ (c) $\alpha=\frac{-\pi}{2},\beta=\frac{3\pi}{2}$ (d) $\alpha=0,\beta=2\pi$

7. If $\sin^{-1}x+\sin^{-1}y=\frac{\pi}{2}$, then the value of $\cos^{-1}x+\cos^{-1}y$ is

(a) $\frac{\pi}{2}$ (b) 0 (c) π (d) $\frac{2\pi}{3}$

8. If $3\tan^{-1}x + \cot^{-1}x = \pi$, then x equals
(a) 0 (b) 1 (c) –1 (d) 1/2

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.

(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.

9. **Assertion (A):** Range of $\cot^{-1} x$ is $(0, \pi)$
Reason (R): Domain of $\tan^{-1} x$ is R.

10. **Assertion (A):** Principal value of $\tan^{-1}(-\sqrt{3})$ is $\frac{\pi}{3}$.
Reason (R): $\tan^{-1}$: IR→ $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ so for any x ϵ IR, $\tan^{-1}(x)$ represents an angle in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the value of $\sin^{-1}\left(\cos\left(\frac{33\pi}{5}\right)\right)$

12. Find the domain of $\sin^{-1}(x^2 - 4)$

13. Find the value of $\sin^{-1}\left(\sin\left(\frac{13\pi}{7}\right)\right)$

14. Find the value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Find the values of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right) + \sin^{-1}\left(-\frac{1}{2}\right)$

16. Prove that $\tan^{-1}\left(\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}\right) = \frac{\pi}{4} - \frac{1}{2}\cos^{-1} x$

17. Express $\tan^{-1}\left(\frac{\cos x}{1 - \sin x}\right), -\frac{\pi}{2} < x < \frac{\pi}{2}$ in the simplest form.

SECTION – D

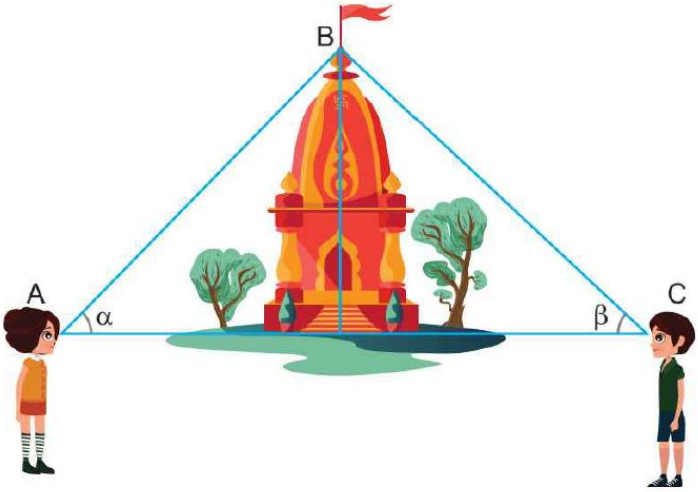
Questions 18 carry 5 marks.

18. Prove that $\cot^{-1}\left(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}\right) = \frac{x}{2}, x \in \left(0, \frac{\pi}{4}\right)$

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Two men on either side of a temple of 30 metres high from the level of eye observe its top at the angles of elevation α and β respectively. (as shown in the below figure). The distance between the two men is $40\sqrt{3}$ metres and the distance between the first person A and the temple is $30\sqrt{3}$ metres.

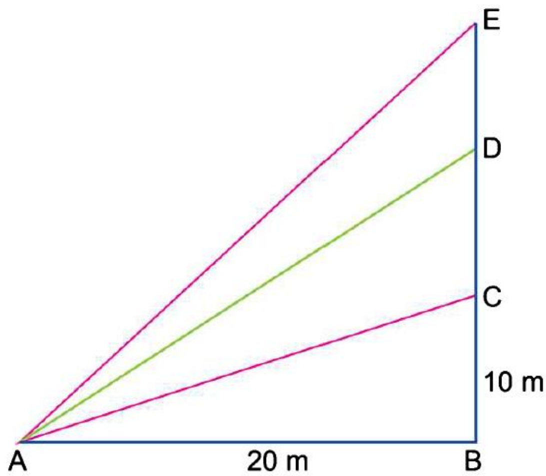


Based on the above information answer the following:

(i) Find the measure of ∠CAB in terms of $\sin^{-1}$ and $\cos^{-1}$.

(ii) Find the measure of ∠ABC.

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



Based on the above information, answer the following questions:

(i) Find the measure of ∠DAB

(ii) Find the measure of ∠EAB

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PRACTICE PAPER 03 (2023-24)
CHAPTER 03 MATRICES

SUBJECT: MATHEMATICS — **MAX. MARKS : 40**
CLASS : XII — **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A$ is

(*a*) I (*b*) $2A$ (c) $3I$ (*d*) A

2. The diagonal elements of a skew symmetric matrix are

(*a*) all zeroes (*b*) are all equal to some scalar $k(\neq 0)$
(*c*) can be any number (*d*) none of these

3. If $A = \begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and $A = A'$ then

(*a*) $x = 0, y = 5$ (*b*) $x = y$ (*c*) $x + y = 5$ (*d*) $x - y = 5$

4. If $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$, then write the value of x and y.

(a) x = 3, y = 3 (b) x = 3, y = 2 (c) x = 2, y = 2 (d) x = 2, y = 3

5. A is a skew-symmetric matrix and a matrix B such that B’AB is defined, then B’AB is a:

(a) symmetric matrix (b) skew-symmetric matrix
(c) Diagonal matrix (d) upper triangular symmetric

6. If $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} 7 & 11 \\ k & 23 \end{bmatrix}$, then write the value of k.

(a) 17 (b) -17 (c) 13 (d) -13

7. If $x\begin{bmatrix} 2 \\ 3 \end{bmatrix} + y\begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \end{bmatrix}$, find the value of x.

(a) 1 (b) 2 (c) 3 (d) 4

8. The matrix A = $\begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is a symmetric matrix. Then the value of a and b respectively are:

(a) $\frac{-2}{3}, \frac{3}{2}$ (b) $\frac{-1}{2}, \frac{1}{2}$ (c) -2, 2 (d) $\frac{3}{2}, \frac{1}{2}$

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.

(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.

9. **Assertion (A):** Let A = $\begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 4 & 7 \end{bmatrix}$ and B = $\begin{bmatrix} 4 & 3 & 6 \\ 7 & 8 & 9 \\ 5 & 1 & 2 \end{bmatrix}$, then the product of the matrices A and B is not defined.

Reason (R): The number of rows in B is not equal to number of columns in A.

10. **Assertion (A):** The matrix A = $\begin{bmatrix} 0 & -1 & -2 \\ 1 & 0 & -3 \\ 2 & 3 & 0 \end{bmatrix}$ is a skew symmetric matrix.

Reason (R): For the given matrix A we have A' = A.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the value of *a*, *b*, *c* and *d* from the equation: $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$

12. Find X and Y, if X + Y = $\begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}$ and X – Y = $\begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$.

13. Find the values of *x*, *y* and *z*, if $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$

14. Find the values of *x* and *y* from the following equation:

$$2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = 0$

16. If $A = \begin{bmatrix} 0 & -\tan\frac{\alpha}{2} \\ \tan\frac{\alpha}{2} & 0 \end{bmatrix}$ and I is the identity matrix of order 2, show that

$$I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$$

17. Express the matrix $B=\begin{bmatrix}2 & -2 & -4\\ -1 & 3 & 4\\ 1 & -2 & -3\end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

SECTION – D

Questions 18 carry 5 marks.

18. Given A = $\begin{bmatrix}1 & -1 & 0\\ 2 & 3 & 4\\ 0 & 1 & 2\end{bmatrix}$ and B = $\begin{bmatrix}2 & 2 & -4\\ -4 & 2 & -4\\ 2 & -1 & 5\end{bmatrix}$, verify that BA = 6I, how can we use the result to find the values of x, y, z from given equations x – y = 3, 2x + 3y + 4z = 17, y + 2z = 17

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. To promote the usage of house toilets in villages, especially for women, are organisations tried to generate awareness among the villagers through (i) house calls (ii) letters, and (iii) announcements.

The cost for each mode per attempt is given below.
(i) ₹ 50 (ii) ₹ 20 (iii) ₹ 40
The number of attempts made in villages X, Y, and Z is given below:

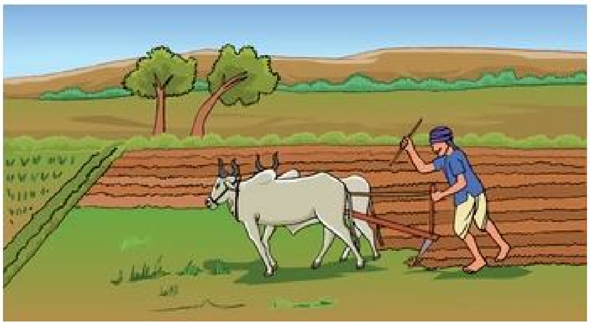
	(i)	(ii)	(iii)
X	400	300	100
Y	300	250	75
Z	500	400	150

Also, the chance of making toilets corresponding to one attempt of given modes is:
(i) 2% (ii) 4% (iii) 20%
Let A, B, and C be the cost incurred by organisation in three villages respectively.
Based on the above information answer the following questions:
(i) Form a required matrix on the basis of the given information. [1]
(ii) From a matrix, related to the number of toilets expected in villagers X, Y, and Z after the promotion campaign. [1]
(iii) What is the total amount spent by the organisation in all three villages X, Y, and Z? [2]

OR

(iii) What is the total no.of toilets expected after the promotion campaign? [2]

20. Two farmers Ankit and Girish cultivate only three varieties of pulses namely Urad, Masoor 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.)

$$A = \begin{pmatrix} Urad & Masoor & Mung \\ 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{pmatrix} \begin{matrix} \\ Ankit \\ Girish \end{matrix}$$

October sales (in Rs.)

$$B = \begin{pmatrix} Urad & Masoor & Mung \\ 5000 & 10000 & 6000 \\ 20000 & 30000 & 10000 \end{pmatrix} \begin{matrix} \\ Ankit \\ Girish \end{matrix}$$

(i) Find the combined sales of Masoor in September and October, for farmer Girish. [1]
(ii) Find the combined sales of Urad in September and October, for farmer Ankit. [1]
(iii) Find a decrease in sales from September to October. [2]

OR

(iii) If both the farmers receive 2% profit on gross sales, then compute the profit for each farmer and for each variety sold in October. [2]

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PRACTICE PAPER 04 (2023-24)

CHAPTER 04 DETERMINANTS

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : XII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. For what value of k ∈ N, $\begin{vmatrix} k & 3 \\ 4 & k \end{vmatrix} = \begin{vmatrix} 4 & -3 \\ 0 & 1 \end{vmatrix}$ is .

(a) 4 (b) 1 (c) 3 (d) 0

2. Find the cofactor of a_{12} in the following: $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$

(a) -46 (b) 46 (c) 0 (d) 1

3. If $\begin{vmatrix} 4 & 1 \\ 2 & 1 \end{vmatrix}^2 = \begin{vmatrix} 3 & 2 \\ 1 & x \end{vmatrix} - \begin{vmatrix} x & 3 \\ -2 & 1 \end{vmatrix}$, then the value of x is:

(a) 6 (b) 3 (c) 7 (d) 1

4. If A and B are square matrices of order 3 such that |A| = 1 and |B| = 3, then the value of |3AB| is:

(a) 3 (b) 9 (c) 27 (d) 81

5. If one root of the equation $\begin{vmatrix} 7 & 6 & x \\ 2 & x & 2 \\ x & 3 & 7 \end{vmatrix} = 7$ is x = -9, then the other two roots are:

(a) 6, 3 (b) 6, -3 (c) -2, -7 (d) 2, 6

6. Let A be a non-singular matrix of order (3 × 3). Then |adj.A| is equal to

(a) |A| (b) $|A|^2$ (c) $|A|^3$ (d) 3|A|

7. The maximum value of $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1+\cos\theta & 1 & 1 \end{vmatrix}$, where θ is a real number is:

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

8. A and B are invertible matrices of the same order such that $|(AB)^{-1}| = 8$, If $|A| = 2$, then $|B|$ is
(*a*) 16 (*b*) 4 (*c*) 6 (*d*) 1/16

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c)Assertion (A) is true but reason (R) is false.
(d)Assertion (A) is false but reason (R) is true.

9. Assertion (A): The matrix A = $\begin{bmatrix} 2 & 3 & -1/2 \\ 7 & 3 & 2 \\ 3 & 1 & 1 \end{bmatrix}$ is singular.

Reason (R): The value of determinant of matrix A is zero.

10. Assertion (A): The value of determinant of a matrix and the value of determinant of its transpose are equal.
Reason (R): The value of determinant remains unchanged if its rows and columns are interchanged.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the value of x, such that the points (0, 2), (1, x) and (3, 1) are collinear.

12. Area of a triangle with vertices (k, 0), (1, 1) and (0, 3) is 5 sq units. Find the value(s) of k.

13. If $\begin{vmatrix} x+1 & x-1 \\ x-3 & x+2 \end{vmatrix} = \begin{vmatrix} 4 & -1 \\ 1 & 3 \end{vmatrix}$, then write the value of x.

14. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then find the value of k if $|2A| = k|A|$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. If $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$, show that $A'A^{-1} = \begin{bmatrix} \cos 2x & -\sin 2x \\ \sin 2x & \cos 2x \end{bmatrix}$.

16. Show that $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ satisfies the equation $x^2 - 6x + 17 = O$. Hence find A^{-1}.

17. If $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 6 \\ 3 & 2 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

SECTION – D

Questions 18 carry 5 marks.

18. If A = $\begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$, find A^{-1} and hence solve the system of linear equations: $2x - 3y + 5z = 11$, $3x + 2y - 4z = -5$; $x + y - 2z = -3$.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case-Study 3:

Two schools A and B want to award their selected students on the values of Honesty, Hard work and Punctuality. The school A wants to award ₹ x each, ₹ y each and ₹ z each for the three respective values to its 3, 2 and 1 students respectively with a total award money of ₹ 2200. School B wants to spend ₹ 3100 to award its 4, 1 and 3 students on the respective values (by giving the same award money to the three values as school A). The total amount of award for one prize on each value is ₹ 1200.

Using the concept of matrices and determinants, answer the following questions.

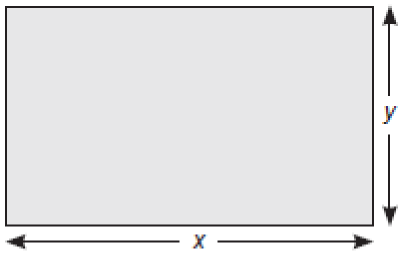
(i) What is the award money for Honesty? [1]

(ii) What is the award money for Punctuality? [1]

(iii) What is the award money for Hard work? [1]

(iv) If a matrix P is both symmetric and skew-symmetric, then find |P|. [1]

20. Manjit wants to donate a rectangular plot of land for a school in his village. When he was asked to give dimensions of the plot, he told that if its length is decreased by 50 m and breadth is increased by 50 m, then its area will remain same, but if length is decreased by 10 m and breadth is decreased by 20 m, then its area will decrease by 5300 m^2.



Based on the information given above, answer the following questions:

(a) Find the equations in terms of x and y (1)

(b) Find the value of x (length of rectangular field). (1)

(c) Find the value of y (breadth of rectangular field). (1)

(d) How much is the area of rectangular field? (1)

KENDRIYA VIDYALAYA GACHIBOWLI, GPRA CAMPUS, HYD–32

PRACTICE PAPER 05 (2023-24)

CHAPTER 05 CONTINUITY AND DIFFERENTIABILITY

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : XII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. A function f is said to be continuous for $x \in R$, if

(a) it is continuous at $x = 0$ (b) differentiable at $x = 0$

(c) continuous at two points (d) differentiable for $x \in R$

2. A function $f(x) = \begin{cases} \frac{\sin x}{x} + \cos x, x \neq 0 \\ 2k \quad , x = 0 \end{cases}$ is continuous at $x = 0$ for

(a) $k = 1$ (b) $k = 2$ (c) $k = \frac{1}{2}$ (d) $k = \frac{3}{2}$

3. If $y = \tan^{-1}\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to

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

4. If $y = \sin^{-1}\left(\frac{3x}{2} - \frac{x^3}{2}\right)$, then $\frac{dy}{dx}$ is

(a) $\frac{3}{\sqrt{4-x^2}}$ (b) $\frac{-3}{\sqrt{4-x^2}}$ (c) $\frac{1}{\sqrt{4-x^2}}$ (d) $\frac{-1}{\sqrt{4-x^2}}$

5. If $y = Ae^{5x} + Be^{-5x}$ then $\frac{d^2y}{dx^2}$ is equal to

(a) $25y$ (b) $5y$ (c) $-25y$ (d) $10y$

6. Derivative of $\sin x$ with respect to $\log x$, is

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

7. The function 'f' defined by $f(x) =$ $f(x) = \begin{cases} \frac{x^3-8}{x-2}, x \neq 2 \\ 12 \ , x = 2 \end{cases}$ is

(a) not continuous at $x = 2$ (b) continuous at $x = 2$

(c) not continuous at $x = 3$ (d) not continuous at $x = -2$

8. If $x = at^2$, $y = 2at$, then $\frac{d^2y}{dx^2}$ is

(a) $\frac{1}{t}$ (b) $-\frac{1}{t^2}$ (c) at^2 (d) $-\frac{1}{2at^3}$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c)Assertion (A) is true but reason (R) is false.
(d)Assertion (A) is false but reason (R) is true.

9. **Assertion (A):** f(x)= |x – 3| is continuous at x = 0.
Reason (R): f(x) = |x – 3| is differentiable at x = 0.

10. **Assertion (A):** Every differentiable function is continuous but converse is not true.
Reason (R): Function f(x) = |x| is continuous.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the value of *k* so that the function *f* defined by $f(x) = \begin{cases} kx+1, if & x \le \pi \\ \cos x, if & x > \pi \end{cases}$ is continuous at $x = \pi$.

12. Find $\frac{dy}{dx}$, if $\sin y + x = \log x$

13. Differentiate 5sin *x*, with respect to *x*.

14. Discuss the continuity of the function *f*(*x*) at *x* = 1, defined by $f(x) = \begin{cases} \frac{3}{2} - x, if & \frac{1}{2} \le x < 1 \\ \frac{3}{2}, if & x = 1 \\ \frac{3}{2} + x, if & 1 < x \le 2 \end{cases}$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Differentiate $x^{x\cos x} + \frac{x^2+1}{x^2-1}$ w.r.t. *x*

16. Show that the function $f(x) = |x - 3|$, $x \in R$ is continuous but not differentiable at $x = 3$.

17. Find $\frac{dy}{dx}$, if $y = \tan^{-1}\left[\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}\right]$

SECTION – D

Questions 18 carry 5 marks.

18. Let $f(x) = \begin{cases} \dfrac{1-\sin^3 x}{3\cos^2 x}, & \text{if } x < \dfrac{\pi}{2} \\ a, & \text{if } x = \dfrac{\pi}{2} \\ \dfrac{b(1-\sin x)}{(\pi - 2x)^2}, & \text{if } x > \dfrac{\pi}{2} \end{cases}$. If $f(x)$ be a continuous function at $x = \dfrac{\pi}{2}$, find *a* and *b*.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case-Study 3:

Sumit has a doubt in the continuity and differentiability problem, but due to COVID-19 he is unable to meet with his teachers or friends. So he decided to ask his doubt with his friends Sunita and Vikram with the help of video call. Sunita said that the given function is continuous for all the real value of x while Vikram said that the function is continuous for all the real value of x except at x = 3.

The given function is f (x) = $\dfrac{x^2 - 9}{x - 3}$

Based on the above information, answer the following questions:

(a) Whose answer is correct? (1)

(b) Find the derivative of the given function with respect to x. (1)

(c) Find the value of $f'(3)$. (1)

(d) Find the second differentiation of the given function with respect to x. (1)

20. 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.

(a) When x > 4 What will be the height in terms of x? (1)

(b) What is $\dfrac{dy}{dx}$ at x = 3? (1)

(c) When the x value lies between (2, 3) then the function is _____ (1)

(d) If the potter is trying to make a pot using the function f(x) = [x], will he get a pot or not? Why? (1)

KENDRIYA VIDYALAYA GACHIBOWLI, GPRA CAMPUS, HYD–32
PRACTICE PAPER 06 (2023-24)
CHAPTER 06 APPLICATION OF DERIVATIVES

SUBJECT: MATHEMATICS — **MAX. MARKS : 40**
CLASS : XII — **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. The function $f(x) = 2x^3 - 15x^2 + 36x + 6$ is increasing in the interval
(a) $(-\infty, 2) \cup (3, \infty)$ (b) $(-\infty, 2)$ (c) $(-\infty, 2] \cup [3, \infty)$ (d) $[3, \infty)$

2. The maximum value of $\left(\frac{1}{x}\right)^x$ is
(a) e (b) e^e (c) $e^{1/e}$ (d) $\left(\frac{1}{e}\right)^{1/e}$

3. A ladder, 5 meter long, standing on a horizontal floor, leans against a vertical wall. If the top of the ladder slides downwards at the rate of 10 cm/sec, then the rate at which the angle between the floor and the ladder is decreasing when lower end of ladder is 2 metres from the wall is
(a) 1/10 radian/sec (b) 1/20 radian/sec (c) 20 radian/sec (d) 10 radian/sec

4. If $f(x) = a(x - \cos x)$ is strictly decreasing in R, then ‘a’ belongs to
(a) $\{0\}$ (b) $(0, \infty)$ (c) $(-\infty, 0)$ (d) $(-\infty, \infty)$

5. The interval in which the function $f(x) = 2x^3 + 9x^2 + 12x - 1$ is decreasing is
(a) $(-1, \infty)$ (b) $(-2,-1)$ (c) $(-\infty, -2)$ (d) $[-1,1]$

6. The value of b for which the function $f(x) = x + \cos x + b$ is strictly decreasing over R is
(a) $b < 1$ (b) No value of b exists (c) $b \leq 1$ (d) $b \geq 1$

7. A wire of length 20 cm is bent in the form of a sector of a circle. The maximum area that can be enclosed by the wire is:
(a) 20 sq cm (b) 25 sq cm (c) 10 sq cm (d) 30 sq cm

8. The value of x for which $(x - x^2)$ is maximum, is:
(a) 3/4 (b) 1/2 (c) 1/3 (d) 1/4

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. **Assertion (A) :** $f(x) = x^4$ is decreasing in the interval $(0, \infty)$.

Reason (R) : Any function $y = f(x)$ is decreasing if $\frac{dy}{dx} < 0$

10. Assertion (A): The rate of change of area of a circle with respect to its radius r when r = 6 cm is $12\pi cm^2/cm$.

Reason (R): Rate of change of area of a circle with respect to its radius *r* is $\frac{dA}{dr}$, where A is the area of the circle.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the values of x for which $y = [x(x - 2)]^2$ is an increasing function.

12. Show that the function f defined by $f(x) = (x - 1)e^x + 1$ is an increasing function for all x > 0.

13. Find the rate of change of volume of sphere with respect to its surface area, when radius is 2 cm.

14. The amount of pollution content added in air in a city due to x-diesel vehicles is given by $P(x) = 0.005x^3 + 0.02x^2 + 30x$. Find the marginal increase in pollution content when 3 diesel vehicles are added.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Find the intervals in which the function $f(x) = \frac{x^4}{4} - x^3 - 5x^2 + 24x + 12$ is

(a) strictly increasing (b) strictly decreasing.

16. Find the absolute maximum and absolute minimum values of the function f given by $f(x) = \sin^2 x - \cos x$, $x \in [0, \pi]$.

17. The volume of a cube is increasing at the rate of 9 cm3/s. How fast is its surface area increasing when the length of an edge is 10 cm?

SECTION – D

Questions 18 carry 5 marks.

18. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Also find the maximum volume.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case-Study 1: An owner of a car rental company have determined that if they charge customers Rs x per day to rent a car, where $50 \leq x \leq 200$, then number of cars (n), they rent per day can be shown by linear function n(x) = 1000 – 5x. If they charge Rs. 50 per day or less they will rent all their cars. If they charge Rs. 200 or more per day they will not rent any car.

Based on the above information, answer the following question.

(i) If R(x) denote the revenue, then find the value of x at which R(x) has maximum value.
(ii) Find the Maximum revenue collected by company

OR

Find the number of cars rented per day, if x = 75.

20. Case-Study 2: Sonam wants to prepare a sweet box for Diwali at home. For making lower part of box, she takes a square piece of cardboard of side 18 cm.
Now, 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.

Based on the above information, answer the following questions :
(i) Express Volume of the open box formed by folding up the cutting corner in terms of x and find the value of x for which $\frac{dV}{dx} = 0$.
(ii) Sonam is interested in maximising 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?

KENDRIYA VIDYALAYA GACHIBOWLI, GPRA CAMPUS, HYD–32

PRACTICE PAPER 07 (2023-24)

CHAPTER 07 INTEGRALS

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : XII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The value of $\int_0^{2\pi} \frac{dx}{e^{\sin x}+1}$ is

(a) π (b) 0 (c) 3 π (d) π/2

2. Evaluate: $\int \frac{\sin^2 x - \cos^2 x}{\sin^2 x \cos^2 x} dx$

(a) tanx – cotx + C (b) –tanx + cotx + C
(c) tanx + cotx + C (d) –tanx – cotx +C

3. The value of is $\int_1^2 \frac{dx}{x\sqrt{x^2-1}}$:

(a) π/3 (b) π/2 (c) π/4 (d) π/6

4. The value of $\int_0^a \frac{\sqrt{a}}{\sqrt{x}+\sqrt{a-x}} dx$ is:

(a) a/2 (b) a (c) a^2 (d) 0

5. The value of $\int \frac{1}{e^x - 1} dx$ is:

(a) log e^x + C (b) log|1 – e^{-x}| + C

(c) $\log\log\frac{1}{e^x}$ + C (d) log|e^x – 1| + C

6. The value of $\int_{-1}^{1} (x-[x])dx$ is:

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

7. The value of $\int_1^2 \frac{dx}{x\sqrt{x^2-1}}$ is:

(a) π/3 (b) π/2 (c) π/4 (d) π/6

8. $\int \cos^3 x.e^{\log(\sin x)} dx$ is equal to

(a) $-\frac{\cos^4 x}{4}+C$ (b) $-\frac{\sin^4 x}{4}+C$ (c) $\frac{e^{\sin x}}{4}+C$ (d) none of these

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. Assertion(A): $\int \frac{1}{\sqrt{x^2+2x+10}}dx = \sin^{-1}\left(\frac{x+1}{3}\right)+C$

Reason(R) : If a > 0, $b^2 - 4ac < 0$ then $\int \frac{1}{\sqrt{ax^2+bx+c}}dx = \frac{1}{\sqrt{a}}\sin^{-1}\left(\frac{2ax+b}{\sqrt{4ac-b^2}}\right)+C$

10. Assertion(A): $\int_{-3}^{3}(x^3+5)dx = 30$

Reason(R): $f(x) = x^3 + 5$ is an odd function.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Evaluate: $\int \sqrt{1-\sin 2x}\,dx,\ \frac{\pi}{4} < x < \frac{\pi}{2}$

12. Find the value of $\int_1^2 \frac{dx}{x(1+\log x)^2}$.

13. Evaluate: $\int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}dx$

14. Evaluate: $\int \frac{dx}{9x^2+6x+10}$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Evaluate: $\int_0^{\pi/2} \frac{dx}{1+\sqrt{\tan x}}$

16. Evaluate: $\int e^x \frac{(1-\sin x)}{(1-\cos x)}dx$

17. Evaluate: $\int \frac{3x+1}{(x-1)^2(x+3)}dx$

SECTION – D

Questions 18 carry 5 marks.

18. Evaluate: $\int \frac{x^2}{x^4-x^2-12}dx$

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case-Study 1: Read the following passage and answer the questions given below.
A general election of Lok Sabha is a gigantic exercise. About 911 million people were eligible to vote and voter turnout was about 67%, the highest ever.

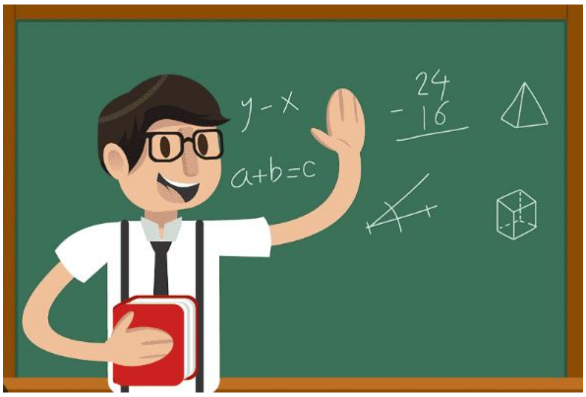
Let f(x) be the set of all citizens of India who were eligible to exercise their voting right in the general election held in 2019. A relation 'R' is defined on I as follows:

If f(x) is a continuous function defined on [a, b] $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$ on the basis of the above information answer the following equations:

(a) Evaluate: $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos x}{1+e^x}dx$ [2]

(b) Find the value of $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1+a^x}dx$, a > 0. [2]

20. Case-Study 2: Mr. Kumar is a Maths teacher. One day he taught students that the Integral $I = \int f(x)dx$ can be transformed into another form by changing the independent variable x to t by substituting



Consider $I = \int f(x)dx$

Put $x = g(t)$ so that $\frac{dx}{dt} = g'(t)$ then we write $dx = g'(t)dt$

Thus, $I = \int f(x)dx = \int f(g(t))g'(t)dt$

This change of variable formula is one of the important tools available to us in the name of integration by substitution.

Based on the above information, answer the following questions:

(i) Evaluate: $\int \frac{e^{\tan^{-1}x}}{1+x^2}dx$ (2)

(ii) Evaluate: $\int \frac{x^3}{(x^2+1)^3}dx$ (2)

OR

(ii) Evaluate: $\int \frac{dx}{x\sqrt{x^6-1}}dx$ (2)

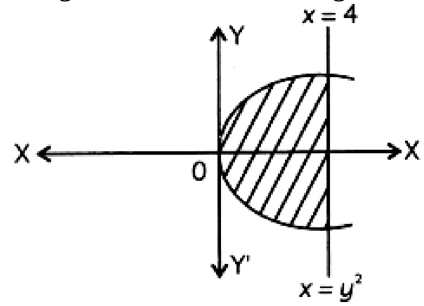
KENDRIYA VIDYALAYA GACHIBOWLI, GPRA CAMPUS, HYD–32
PRACTICE PAPER 08 (2023-24)
CHAPTER 08 APPLICATION OF INTEGRALS

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : XII **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. The area (in sq. m) of the shaded region as shown in the figure is:



(a) 32/3 sq. units (b) 16/3 sq. units (c) 4 sq. units (d) 16 sq. units

2. The area enclosed by the circle $x^2 + y^2 = 8$ is
(a) 16p sq units (b) $2\sqrt{2}\pi$ sq units (c) $8\pi^2$ sq units (d) 8π sq units

3. The area bounded between the curves $y^2 = 6x$ and $x^2 = 6y$ is
(a) 6 sq units (b) 12 sq units (c) 36 sq units (d) 24 sq units

4. The area enclosed within the curve $|x| + |y| = 1$ is
(a) 21 (b) 1.5 (c) 2 (d) none of these

5. The area bounded by the curve $x^2 = 4y$ and the straight line $x = 4y – 2$ is
(a) $\frac{3}{8}$ (b) $\frac{5}{8}$ (c) $\frac{7}{8}$ (d) $\frac{9}{8}$

6. The area enclosed by the circle $x^2 + y^2 = 16$ is
(a) 20 (b) 20π (c) 16π (d) 256π

7. Area of the region bounded by the curve $y = \cos x$ between $x = 0$ and $x = 2\pi$ is
(a) 4 (b) 3 (c) 2 (d) 1

8. The area of the region bounded by the parabolas $y = x^2$ and $y^2 = x$ is
(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{1}{6}$ (d) $\frac{1}{4}$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. **Assertion (A):** The area of the ellipse $2x^2 + 3y^2 = 6$ will be more than the area of the circle $x^2 + y^2 - 2x + 4y + 4 = 0$.
Reason (R): The length of the semi-major axis of ellipse 2x2 + 3y2 = 6 is more than the radius of the circle $x^2 + y^2 - 2x + 4y + 4 = 0$.

10. **Assertion (A):** Area enclosed by the circle $x^2 + y^2 = 36$ is equal to 36π sq. units.
Reason (R): Area enclosed by the circle $x^2 + y^2 = r^2$ is πr^2.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Sketch the region $\{(x, 0): y = \sqrt{4-x^2}\}$ and X-axis. Find the area of the region using integration.

12. Find the area of the region bounded by the curve $y = \frac{1}{x}$, x-axis and between $x = 1$, $x = 4$.

13. Find the area of the region bounded by the curve $y = x^2$ and the line $y = 4$.

14. Find the area bounded by the curve y = sin x between x = 0 and x = 2π.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Make a rough sketch of the region $\{(x, y): 0 \le y \le x^2, 0 \le y \le x, 0 \le x \le 2\}$ and find the area of the region using integration.

16. Using integration, find the smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line x + y = 2.

17. Find the area of the region bounded by the line $y = 3x + 2$, the x-axis and ordinates at $x = -1$ and $x = 1$.

SECTION – D

Questions 18 carry 5 marks.

18. Using integration, find the area of triangle ABC, whose vertices are A(2, 5), B(4, 7) and C(6, 2).

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

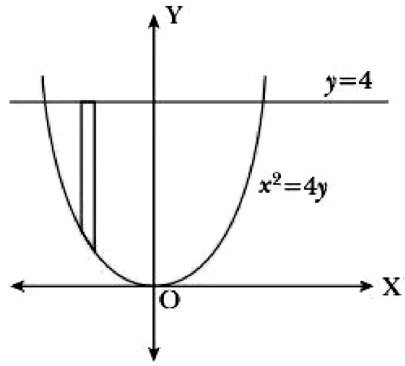
19. **Case-Study 1: Read the following passage and answer the questions given below.**
An architect designs a building whose lift (elevator) is from outside of the building attached to the walls. The floor (base) of the lift (elevator)) is in circular shape.

The floor of the elevator (lift) whose circular edge is given by the equation $x^2 + y^2 = 4$ and the straight edge (line) is given by the equation $y = 0$.
(i) Find the point of intersection of the circular edge and straight line edge.
(ii) Find the length of each vertical strip of the region bounded by the given curves.
(iii) (a) Find the area of a vertical strip between given circular edge and straight edge.
(b) Find the area of a horizontal strip between given circular strip and straight edge.

OR

(iii) Find the area of the region of the floor of the lift of the building (in square units).

20. Case-Study 2: Read the following passage and answer the questions given below.
A student designs an open air Honeybee nest on the branch of a tree, whose plane figure is parabolic and the branch of tree is given by a straight line.



(i) Find point of intersection of the parabola and straight line.
(i) Find the area of each vertical strip.
(iii) (a) Find the length of each horizontal strip of the bounded region.
(b) Find the length of each vertical strip.

OR

(iii) Find the area of region bounded by parabola $x^2 = 4y$ and line $y = 4$ (in square units).

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PRACTICE PAPER 09 (2023-24)

CHAPTER 09 DIFFERENTIAL EQUATIONS

SUBJECT: MATHEMATICS | **MAX. MARKS : 40**

CLASS : XII | **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If m and n are the order and degree, respectively of the differential equation $y\left(\frac{dy}{dx}\right)^3 + x^3\left(\frac{d^2y}{dx^2}\right)^2 - xy = \sin x$, then write the value of m + n.

(a) 1 (b) 2 (c) 3 (d) 4

2. If $\frac{dy}{dx} = y\sin 2x$, y(0) = 1, then solution is

(a) y = $e^{\sin^2 x}$ (b) y = $\sin^2 x$ (c) y = $\cos^2 x$ (d) y = $e^{\cos^2 x}$

3. If m and n are the order and degree, respectively of the differential equation $5x\left(\frac{dy}{dx}\right)^2 - \frac{d^2y}{dx^2} - 6y = \log x$, then write the value of m + n.

(a) 1 (b) 2 (c) 3 (d) 4

4. The order and the degree of the differential equation $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ are:

(a) 1, 1 (b) 2, 1 (c) 1, 2 (d) 3, 1

5. The general solution of the differential equation e^x dy + (y e^x + 2x) dx = 0 is

(a) x e^y + x^2 = C (b) x e^y + y^2 = C (c) y e^x + x^2 = C (d) y e^y + x^2 = C

6. The general solution of the differential equation $\frac{dy}{dx} = 2^{-y}$ is:

(a) 2y = x log 2 + C log 2 (b) 2y = x log 3 – C log 3

(c) y = x log 2 – C log 2 (d) None of these

7. The integrated factor of the differential equation: $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$ is

(a) $\frac{1}{e^{\tan^{-1}x}}$ (b) $2e^{\tan^{-1}x}$ (c) $3e^{\tan^{-1}x}$ (d) $e^{\tan^{-1}x}$

8. Solution of the differential equation $x\frac{dy}{dx} + y = xe^x$ is

(a) xy = e^x (1 – x) + C (b) xy = e^x (x + 1) + C

(c) xy = e^y (y – 1) + C (d) xy = e^x (x – 1) + C

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. Assertion (A): Solution of the differential equation $(1+x^2)\frac{dy}{dx}+y=\tan^{-1}x$ is $ye^{\tan^{-1}x}=(\tan^{-1}x-1)e^{\tan^{-1}x}+C$

Reason (R) : The differential equation of the form $\frac{dy}{dx}+Py=Q$, where P, Q be the functions of x or constant, is a linear type differential equation.

10. Assertion (A): Solution of the differential equation $e^{dy/dx}=x^2$ is y = 2(*x*log*x* – *x*) + C.

Reason (R): The differential equation $\frac{d^2y}{dx^2}+y=0$ has degree 1 and order 2.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the general solution of the differential equation $\frac{dy}{dx}=x-1+xy-y$.

12. Solve the following differential equation: $\frac{dy}{dx}=x^3\operatorname{cosec}y$, given that y(0) = 0.

13. Solve : $(x^2 - yx^2)dy + (y^2 + x^2y^2)dx = 0$

14. Solve the differential equation: $x\frac{dy}{dx}-y=x^2$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Find the general solution of the following differential equation; $x\,dy - (y + 2x^2)dx = 0$

16. Solve : $(x^2 + y^2)\,dx - 2xydy = 0$

17. Solve the following differential equation: $\left[x\sin^2\left(\frac{y}{x}\right)-y\right]dx+xdy=0$

SECTION – D

Questions 18 carry 5 marks.

18. Show that the general solution of the differential equation $\frac{dy}{dx}+\frac{y^2+y+1}{x^2+x+1}=0$ is given by (x + y + 1) = A(1 – x – y – 2xy), where A is a parameter.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case-Study 1: Read the following passage and answer the questions given below.
A Veterinary doctor was examining a sick cat brought by a pet lover. When it was brought to the hospital, it was already dead. The pet lover wanted to find its time of death. He took the temperature of the cat at 11.30 pm which was 94.6°F. He took the temperature again after one

hour; the temperature was lower than the first observation. It was 93.4°F. The room in which the cat was put is always at 70°F. The normal temperature of the cat is taken as 98.6°F when it was alive. The doctor estimated the time of death using Newton law of cooling which is governed by the differential equation: $\frac{dT}{dt} \propto (T - 70)$, where 70°F is the room temperature and T is the temperature of the object at time t.

Substituting the two different observations of T and t made, in the solution of the differential equation $\frac{dT}{dt} = k(T - 70)$ where k is a constant of proportion, time of death is calculated.

(a) State the degree of the above given differential equation. (1)
(b) Write method of solving a differential equation helped in calculation of the time of death? (1)
(c) Find the solution of the differential equation $\frac{dT}{dt} = k(T - 70)$. (1)
(d) If t = 0 when T is 72, then find the value of c (1)

20. Case-Study 2: Read the following passage and answer the questions given below.

Polio drops are delivered to 50K children in a district. The rate at which polio drops are given is directly proportional to the number of children who have not been administered the drops. By the end of 2nd week half the children have been given the polio drops. How many will have been given the drops by the end of 3rd week can be estimated using the solution to the differential equation $\frac{dy}{dx} = k(50 - y)$ where x denotes the number of weeks and y the number of children who have been given the drops.

(a) Find the solution of the differential equation $\frac{dy}{dx} = k(50 - y)$ (1)
(b) Find the value of c in the particular solution given that y(0) = 0 and k = 0.049 (1)
(c) Find the solution that may be used to find the number of children who have been given the polio drops. (2)

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PRACTICE PAPER 10 (2023-24)

CHAPTER 10 VECTOR ALGEBRA

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : XII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The vector of the direction of the vector $\hat{i}-2\hat{j}+2\hat{k}$ that has magnitude 9 is

(a) $\hat{i}-2\hat{j}+2\hat{k}$ (b) $\frac{\hat{i}-2\hat{j}+2\hat{k}}{3}$ (c) $3(\hat{i}-2\hat{j}+2\hat{k})$ (d) $9(\hat{i}-2\hat{j}+2\hat{k})$

2. The magnitude of each of the two vectors $\vec{a}$ and $\vec{b}$, having the same magnitude such that the angle between them is 60° and their scalar product is 9/2, is

(a) 2 (b) 3 (c) 4 (d) 5

3. The projection of the vector $2\hat{i}+3\hat{j}+2\hat{k}$ *on the vector* $\hat{i}+2\hat{j}+\hat{k}$ is

(a) 10/√6 (b) 10/√3 (c) 5/√6 (d) 5/√3

4. Find the angle between the vectors $\vec{a}=\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}+\hat{j}-\hat{k}$

(a) $\cos^{-1}\left(-\frac{1}{2}\right)$ (b) 60° (c) $\cos^{-1}\left(-\frac{1}{3}\right)$ (d) $\cos^{-1}\left(-\frac{2}{3}\right)$

5. If $(\hat{i}+3\hat{j}+8\hat{k})\times(3\hat{i}-\lambda\hat{j}+\mu\hat{k})=0$, then λ and μ are respectively:

(a) 27, -9 (b) 9, 9 (c) -9, 18 (d) -1, 1

6. The value of λ such that the vector $\vec{a}=2\hat{i}+\lambda\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}+3\hat{k}$ are orthogonal is:

(a) 3/2 (b) −5/2 (c) −1/2 (d) 1/2

7. For any vector $\vec{a}$, the value of $|\vec{a}\cdot\hat{i}|^2+|\vec{a}\cdot\hat{j}|^2+|\vec{a}\cdot\hat{k}|^2$ is:

(a) a (b) a^2 (c) 1 (d) 0

8. The area of a parallelogram whose one diagonal is $2\hat{i}+\hat{j}-2\hat{k}$ and one side is $3\hat{i}+\hat{j}-\hat{k}$ is

(a) $\hat{i}-4\hat{j}-\hat{k}$ (b) 3√2 sq units (c) 6√2 sq units (d) 6 sq units

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

9. **Assertion (A):** The value of $\hat{i}\cdot(\hat{j}\times\hat{k})+\hat{j}\cdot(\hat{i}+\hat{k})+\hat{k}\cdot(\hat{i}\times\hat{j})$ is 1.

Reason (R): Since, $\hat{i}\cdot\hat{i}=\hat{j}\cdot\hat{j}=\hat{k}\cdot\hat{k}=0$

Assertion (A): The direction of cosines of vector $\vec{a}=2\hat{i}+4\hat{j}-5\hat{k}$ are $\frac{2}{\sqrt{45}},\frac{4}{\sqrt{45}},-\frac{5}{\sqrt{45}}$

Reason (R): A vector having zero magnitude and arbitrary direction is called 'zero vector' or 'null vector'.

SECTION – B

Questions 11 to 14 carry 2 marks each.

10. If $|\vec{a}\times\vec{b}|^2+(\vec{a}.\vec{b})^2=144$ and $|\vec{a}|=4$, then find the value of $|\vec{b}|$.

11. Find the angle between the vectors $\vec{a}=\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}-\hat{j}+\hat{k}$.

12. Given, $\vec{p}=3\hat{i}+2\hat{j}+4\hat{k},\vec{a}=\hat{i}+\hat{j},\vec{b}=\hat{j}+\hat{k},\vec{c}=\hat{i}+\hat{k}$ and $\vec{p}=x\vec{a}+y\vec{b}+z\vec{c}$, then find the value of x, y, z.

13. Using vectors, find the area of the triangle with vertices A(1, 1, 2), B(2, 3, 5) and C(1, 5, 5).

SECTION – C

Questions 15 to 17 carry 3 marks each.

14. Show that the points A(1, 2, 7), B(2, 6, 3) and C(3, 10, –1) are collinear.

15. Find a unit vector perpendicular to each of the vectors $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$, where $\vec{a}=\hat{i}+\hat{j}+\hat{k},\vec{b}=\hat{i}+2\hat{j}+3\hat{k}$.

16. The two adjacent sides of a parallelogram are $2\hat{i}-4\hat{j}+5\hat{k}$ and $\hat{i}-2\hat{j}-3\hat{k}$. Find the unit vector parallel to its diagonal. Also, find its area.

SECTION – D

Questions 18 carry 5 marks.

17. The magnitude of the vector product of the vector $\hat{i}+\hat{j}+\hat{k}$ with a unit vector along the sum of vectors $2\hat{i}+4\hat{j}-5\hat{k}$ and $\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to $\sqrt{2}$. Find the value of λ.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

18. **Case-Study 1: Read the following passage and answer the questions given below.**

Solar panels have to be installed carefully so that the tilt of the roof, and the direction to the sun, produce the largest possible electrical power in the solar panels. A surveyor uses his instrument to determine the coordinates of the four corners of a roof where solar panels are to be mounted. In the picture, suppose the points are labelled counter clockwise from the roof corner nearest to the camera in units of meters P_1 (6, 8, 4), P_2 (21, 8, 4), P_3 (21, 16, 10) and P_4 (6,16,10).

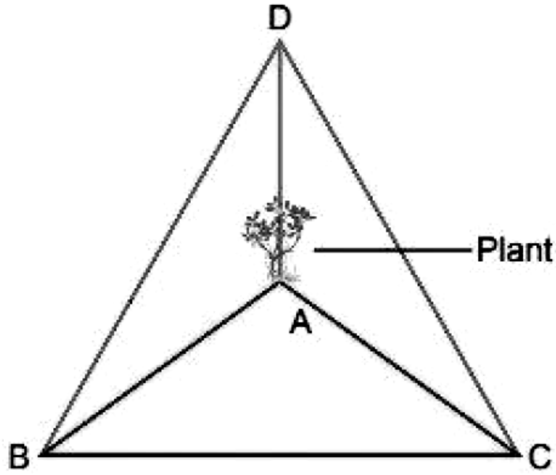
(i) Find the components to the two edge vectors defined by $\vec{A}$ = PV of P_2 – PV of P_1 and $\vec{B}$ = PV of P_4 – PV of P_1 where PV stands for position vector.

(ii) (a) Find the magnitudes of the vectors $\vec{A}$ and $\vec{B}$.

(b) Find the components to the vector $\vec{N}$, perpendicular to $\vec{A}$ and $\vec{B}$ and the surface of the roof.

19. Case-Study 2: Read the following passage and answer the questions given below.

Raghav purchased an air plant holder which is in shape of tetrahedron. Let A, B, C, D be the co-ordinates of the air plant holder where A = (1, 2, 3), B= (3, 2, 1), C = (2, 1, 2), D = (3, 4, 3).



(i) Find the vector $\overrightarrow{AB}$. (1)

(ii) Find the vector $\overrightarrow{CD}$. (1)

(iii) Find the unit vector along $\overrightarrow{BC}$ vector. (2)

OR

(iii) Find the area (ABCD). (2)

PM SHRI KENDRIYA VIDYALAYA GACHIBOWLI,GPRA CAMPUS,HYD–32

PRACTICE PAPER 11 (2023-24)

CHAPTER 11 THREE DIMENSIONAL GEOMETRY

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : XII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. Two-line $\frac{x-3}{1}=\frac{y+1}{3}=\frac{z-6}{-1}$ and $\frac{x+5}{7}=\frac{y-2}{-6}=\frac{z-3}{4}$ intersect at the point R. The reflection of R in the xy plane has coordinates

(a) (2, 4, 7) (b) (-2, 4, 7) (c) (2, -4, -7) (d) (2, -4, 7)

2. Direction ratios of the line $\frac{4-x}{2}=\frac{y}{6}=\frac{1-z}{3}$ are

(a) 2, 6, 3 (b) –2, 6, 3 (c) 2, – 6, 3 (d) none of these

3. The vector equation of the line joining the points (3, -2, -5) and (3, -2, 6) is:

(a) $(4\hat{i}-4\hat{j}+5\hat{k})+\lambda(12\hat{k})$ (b) $(4\hat{i}-4\hat{j}+5\hat{k})+\lambda(12\hat{k})$

(c) $(6\hat{i}-2\hat{j}+2\hat{k})+\lambda(5\hat{k})$ (d) $(9\hat{i}-9\hat{j}-2\hat{k})+\lambda(2\hat{k})$

4. A point that lies on the line $\frac{x-1}{-2}=\frac{y+3}{4}=\frac{1-z}{7}$ is:

(a) (1, -3, 1) (b) (-2, 4, 7) (c) (-1, 3, 1) (d) (2, -4, -7)

5. The direction ratios of the line 6x – 2 = 3y + 1 = 2z – 2 are:

(a) 6, 3, 2 (b) 1, 1, 2 (c) 1, 2, 3 (d) 1, 3, 2

6. The straight line $\frac{x-3}{3}=\frac{y-2}{1}=\frac{z-1}{0}$ is:

(a) parallel to x-axis (b) parallel to y-axis

(c) parallel to z-axis (d) perpendicular to z-axis

7. If the equation of a line AB is $\frac{x-3}{1}=\frac{y+2}{-2}=\frac{z-5}{4}$, find the direction ratios of a line parallel to AB.

(a) 1, 2, 4 (b) 1, 2, –4 (c) 1, –2, –4 (d) 1, –2, 4

8. If a line makes angles α, β, γ with the positive direction of co-ordinates axes, then find the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$.

(a) 1 (b) 2 (c) 3 (d) 4

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. **Assertion (A) :** The angle between the straight lines $\frac{x+1}{2}=\frac{y-2}{5}=\frac{z+3}{4}$ and $\frac{x-1}{1}=\frac{y+2}{2}=\frac{z-3}{-3}$ is 90°.
Reason (R) : Skew lines are lines in different planes which are parallel and intersecting.

10. **Assertion:** If the cartesian equation of a line is $\frac{x-5}{3}=\frac{y+4}{7}=\frac{z-6}{2}$, then its vector form is $\vec{r}=5\hat{i}-4\hat{j}+6\hat{k}+\lambda(3\hat{i}+7\hat{j}+2\hat{k})$
Reason: The cartesian equation of the line which passes through the point (–2, 4, –5) and parallel to the line given by $\frac{x-3}{3}=\frac{y-4}{5}=\frac{z+8}{6}$ is $\frac{x+3}{-2}=\frac{y-4}{4}=\frac{z+8}{-5}$.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the vector equation of the line joining (1, 2, 3) and (–3, 4, 3) and show that it is perpendicular to the z-axis.

12. Show that the line through the points (1, –1, 2), (3, 4, –2) is perpendicular to the line through the points (0, 3, 2) and (3, 5, 6).

13. Find the angle between the straight lines $\frac{x+1}{2}=\frac{y-2}{5}=\frac{z+3}{4}$ and $\frac{1-x}{-1}=\frac{y+2}{2}=\frac{3-z}{3}$.

14. Find the coordinates of the point where the line $\frac{x+3}{3}=\frac{y-1}{-1}=\frac{z-5}{-5}$ cuts the XY plane.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Find the points on the line $\frac{x+2}{3}=\frac{y+1}{2}=\frac{z-3}{2}$ at a distance of 5 units from the point P(1, 3, 3).

16. Find the vector equation of the line through the point (1, 2, –4) and perpendicular to the two lines $\vec{r}=(8\hat{i}-19\hat{j}+10\hat{k})+\lambda(3\hat{i}-16\hat{j}+7\hat{k})$ and $\vec{r}=(15\hat{i}+29\hat{j}+5\hat{k})+\mu(3\hat{i}+8\hat{j}-5\hat{k})$

17. Find the shortest distance between the lines $\vec{r}=(\hat{i}+2\hat{j}+\hat{k})+\lambda(\hat{i}-\hat{j}+\hat{k})$ and $\vec{r}=(2\hat{i}-\hat{j}-\hat{k})+\mu(2\hat{i}+\hat{j}+2\hat{k})$

SECTION – D

Questions 18 carry 5 marks.

18. Find the coordinates of the foot of perpendicular drawn from the point A(–1, 8, 4) to the line joining the points B(0, –1, 3) and C(2, –3, –1). Hence find the image of the point A in the line BC.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. **Case-Study 1: Read the following passage and answer the questions given below.**
The equation of motion of a missile are x = 3t, y = - 4t, z = t, where the time ‘t’ is given in seconds, and the distance is measured in kilometers.

(a) Write the path of the missile.

(b) Find the distance of the rocket from the starting point (0, 0, 0) in 5 seconds.

(c) If the position of the rocket at a certain instant of the time is (5, -8, 10). Find the height of the rocket from the ground. (Ground considered as xy-plane)

OR

(c) Find the value of k for which the lines $\frac{x-1}{2}=\frac{y-1}{3}=\frac{z-1}{k}$ and $\frac{x-2}{-2}=\frac{y-3}{-1}=\frac{z-5}{7}$; are perpendicular?

20. Case-Study 2: Read the following passage and answer the questions given below.

Two non-parallel and non-intersecting straight lines are called skew lines. For skew lines, the line segment of the shortest distance will be perpendicular to both the lines. If the lines are $\vec{r}=\vec{a_1}+\lambda\vec{b_1}$ and $\vec{r}=\vec{a_2}+\mu\vec{b_2}$.

Then, shortest distance is given as $d=\left|\frac{(\vec{b_1}\times\vec{b_2}).(\vec{a_2}-\vec{a_1})}{|\vec{b_1}\times\vec{b_2}|}\right|$

Here, $\vec{a_1},\vec{a_2}$ are position vectors of point through which the lines are passing and $\vec{b_1},\vec{b_2}$ are the vectors in the direction of a line.

(a) If a line has the direction ratios -18, 12, -4 then what are its direction cosines? (1)

(b) Write the condition for which the given two lines $\vec{r}=\vec{a_1}+\lambda\vec{b_1}$ and $\vec{r}=\vec{a_2}+\mu\vec{b_2}$ are not coplanar in vector form. (1)

(c) Write the distance of a point P(a, b, c) from the x-axis (1)

(d) If the cartesian form of a line is $\frac{3-x}{5}=\frac{y+4}{7}=\frac{2z-6}{4}$ then write the vector equation of line. (1)

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PRACTICE PAPER 13 (2023-24)

CHAPTER 12 LINEAR PROGRAMMING

SUBJECT: MATHEMATICS — **MAX. MARKS : 40**

CLASS : XII — **DURATION : 1½ hrs**

General Instructions:

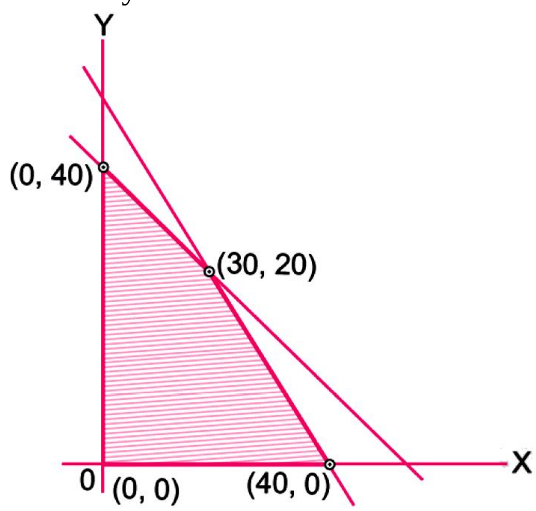
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. 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. The minimum value of F occurs at
(a) Only (0, 2)
(b) Only (3, 0)
(c) the mid-point of the line segment joining the points (0, 2) and (3, 0)
(d) any point on the line segment joining the points (0, 2) and (3, 0)

2. Feasible region (shaded) for a LPP is shown in the given figure. The maximum value of the Z = 0.4x + y is

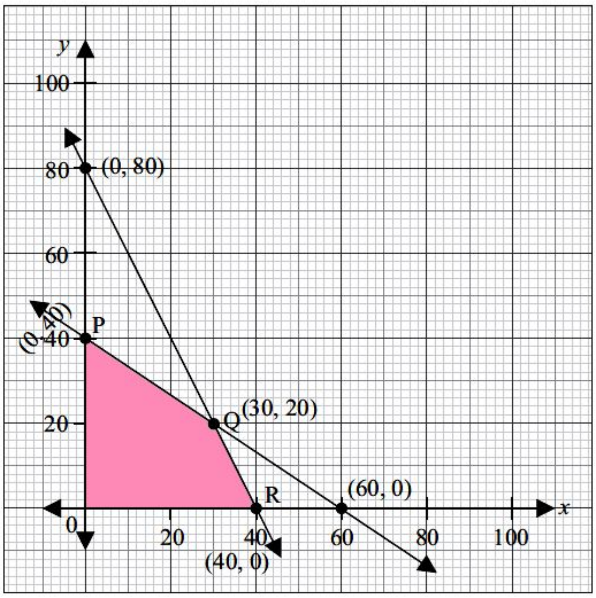


(a) 45 (b) 40 (c) 50 (d) 41

3. A set of values of decision variables that satisfies the linear constraints and non-negativity conditions of an L.P.P. is called its:
(a) Unbounded solution (b) Optimum solution
(c) Feasible solution (d) None of these

4. The corner points of the feasible region determined by the following system of linear inequalities: $2x + y \leq 10$, $x + 3y \leq 15$, $x, y \geq 0$ are (0,0), (5,0), (3,4), (0,5). Let Z= px + qy, where p,q > 0. Condition on p and q so that the maximum of Z occurs at both (3,4) and (0,5) is
(a) p = q (b) p = 2q (c) p = 3q (d) q = 3p

5. For an L.P.P. the objective function is Z = 4x + 3y, and the feasible region determined by a set of constraints (linear inequations) is shown in the graph.



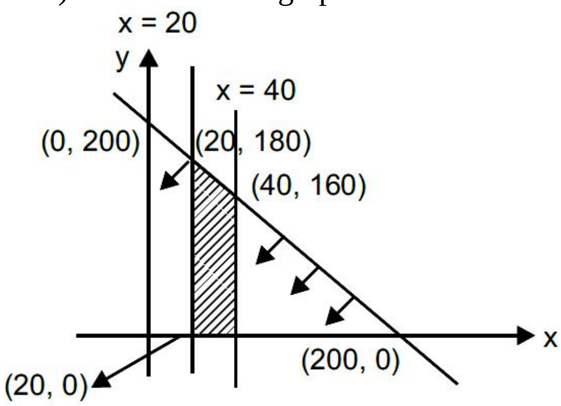
Which one of the following statements is true?

(a) Maximum value of Z is at R.
(b) Maximum value of Z is at Q.
(c) Value of Z at R is less than the value at P.
(d) Value of Z at Q is less than the value at R.

6. Corner points of the feasible region for an LPP are (0, 3), (1,1) and (3,0). Let Z = px + qy, where p, q > 0, be the objective function. The condition on p and q so that the minimum of Z occurs at (3,0) and (1,1) is

(a) p = q
(b) $p = \frac{q}{2}$
(c) p = 3q
(d) p=q

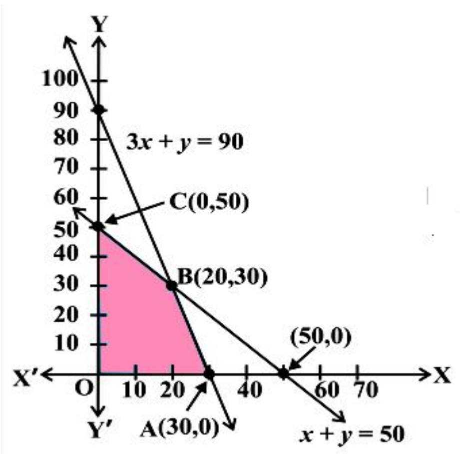
7. For an L.P.P. the objective function is Z = 400x + 300y, and the feasible region determined by a set of constraints (linear inequations) is shown in the graph.



Find the coordinates at which the objective function is maximum.

(a) (20, 0)
(b) (40, 0)
(c) (40, 160)
(d) (20, 180)

8. The corner points of the shaded bounded feasible region of an LPP are (0,0),(30,0),(20,30) and (0,50) as shown in the figure .



The maximum value of the objective function Z = 4x+y is

(a) 120 (b) 130 (c) 140 (d) 150

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

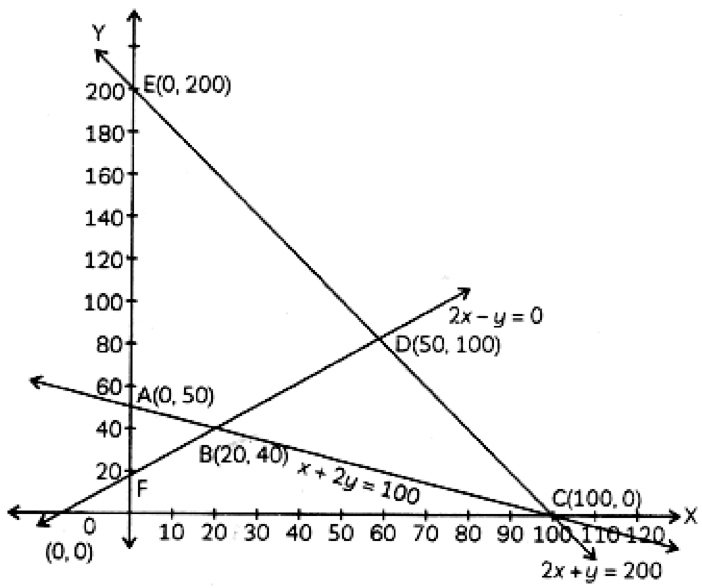
9. **Assertion (A):** The maximum value of $Z = 5x + 3y$, satisfying the conditions $x \geq 20$, $y \geq 0$ and $5x + 2y \leq 10$, is 15.
Reason (R): A feasible region may be bounded or unbounded.

10. **Assertion (A):** The maximum value of $Z = x + 3y$. Such that $2x + y \leq 20$, $x + 2y \leq 20$, $x, y \geq 0$ is 30.
Reason (R): The variables that enter into the problem are called decision variables.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. In a linear programming problem, objective function, $z = x + 2y$. The subjective the constraints
$x + 2y \geq 100$, $2x - y \leq 0$, $2x + y \leq 200$, $x \geq 0$, $y \geq 0$
The graph of the following equations is shown below.



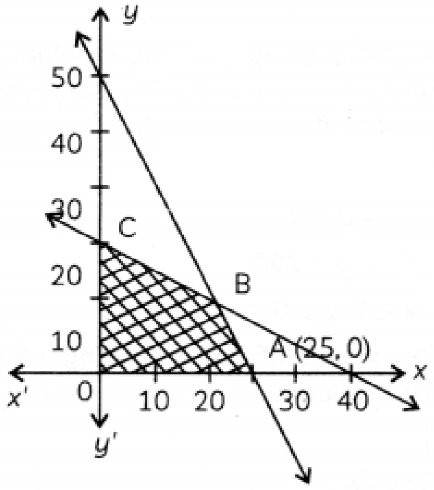
Name the feasible region, and find the corner point at which the objective function is minimum.

12. A manufacturer makes two types of furniture, chairs and tables. Both the products are processed on three machines A_1, A_2 and A_3. Machine A_1 requires 3 hours for a chair and 3 hours for a table, machine A_2 requires 5 hours for a chair and 2 hours for a table and machine A_3 requires 2 hours for a chair and 6 hours for a table. Maximum time available on machine A_1, A_2 and A_3 is 36 hours, 50 hours and 60 hours respectively. Profits are ₹ 20 per chair and ₹30 per table. Formulate the above as a linear programming problem to maximise the profit.

OR

Two tailors *A* and *B* earn ₹150 and ₹200 per day respectively. *A* can stich 6 shirts and 4 pants per day while *B* can stich 10 shirts and 4 pants per day. Form a linear programming problem to minimise the labour cost to produce at least 60 shirts and 52 pants.

13. The feasible region of a ∠PR is given as follows:



(i) Write the constraints with respect to the above in terms of x and y.
(ii) Find the coordinate of B and C and maximize, $z = x + y$.

14. Solve the following LPP graphically: Maximise $Z = 3x + 4y$ and
Subject to $x + y \leq 4$, $x \geq 0$ and $y \geq 0$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Solve the following Linear Programming Problem graphically:
Maximise $z = 8x + 9y$ subject to the constraints: $2x + 3y \leq 6$, $3x - 2y \leq 6$, $y \leq 1$; $x, y \geq 0$

16. Solve the following Linear Programming Problem graphically:
Minimise $Z = 13x - 15y$ subject to the constraints $x + y \leq 7$, $2x - 3y + 6 \geq 0$, $x \geq 0$ and $y \geq 0$.

17. Solve the following Linear Programming Problem graphically:
Maximize $Z = 400x + 300y$ subject to $x + y \leq 200$, $x \leq 40$, $x \geq 20$, $y \geq 0$

SECTION – D

Questions 18 carry 5 marks.

18. Maximise $Z = 8x + 9y$ subject to the constraints given below :
$2x + 3y \leq 6$; $3x - 2y \leq 6$; $y \leq 1$; $x, y \geq 0$

OR

Minimize and maximize $Z = 5x + 2y$ subject to the following constraints:
$x - 2y \leq 2$, $3x + 2y \leq 12$, $-3x + 2y \leq 3$, $x \geq 0$, $y \geq 0$

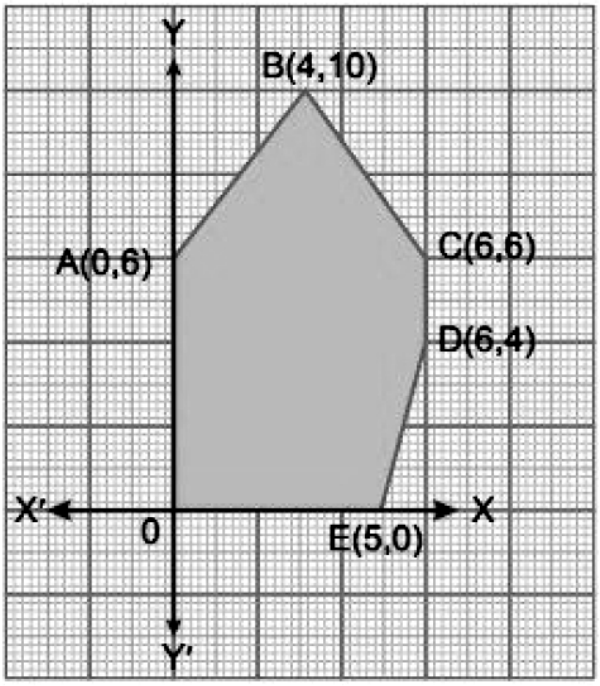
SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case-Study 1: Read the following passage and answer the questions given below.
Linear Programming Problem is a method of or finding the optimal values (maximum or minimum) of quantities subject to the constraints when relationship is expressed as a linear equations or linear inequations.
The corner points of a feasible region determined by the system of linear constraints are as shown below.
(i) Is this feasible region is bounded?
(i) Write the number of corner points in the feasible region.
(iii) (a) If $Z = ax + by$ has maximum value at C (6, 6) and B (4, 10). Find the relationship between a & b.

OR

(iii) (b) If Z = 2x – 5y then find the minimum value of this objective function.



20. Case-Study 2: Read the following passage and answer the questions given below.

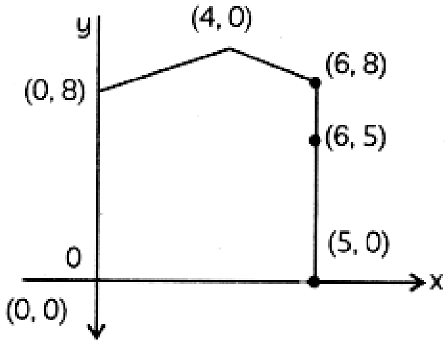
Let R be the feasible region of a linear programming problem and let Z = ax + by be the objective function. When Z has an optimal value (max. or min.), when the variable x and y are subject to constraints described by linear inequalities, this optimal value occurs at the corner point (vertex) of the feasible region.

Based on the above information, answer the following questions:

(i) What is an objective function of LPP? [1]

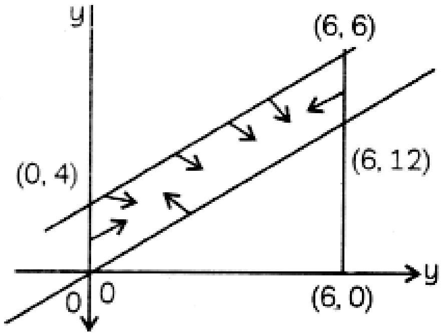
(ii) In solving an LPP "minimize f = 6x + 10y subject to constraints $x \geq 6$, $y \geq 2$, $2x + y \geq 10$, $x \geq 0$, $y \geq 0$" which among is redundant constraint? [1]

(iii) The feasible region for an LPP is shown in the figure. Let Z = 3x – 4y, be the objective function. Then, at which point minimum of Z occurs? [2]



OR

The feasible region for an LPP is shown shaded in the figure. Let F = 3x – 4y be the objective function. Then, what is the maximum value of F. [2]



PM SHRI KENDRIYA VIDYALAYA GACHIBOWLI,GPRA CAMPUS,HYD–32

PRACTICE PAPER 12 (2023-24)

CHAPTER 13 PROBABILITY

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : XII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If P(A) = 1/4, P(B) = 1/3 and P(A ∩ B) = 1/5, then $P(\overline{B}/\overline{A})$ =?

(a) 11/15 (b) 11/45 (c) 37/45 (d) 37/60

2. If the following table represents a probability distribution for a random variable X:

X	1	2	3	4	5	6
P(X)	0.1	2k	K	0.2	3k	0.1

The value of k is:

(a) 0.01 (b) 0.1 (c) 1/1000 (d) 25

3. A dice is tossed thrice. The probability of getting an odd number at least once is:

(a) 7/8 (b) 1/3 (c) 3/8 (d) 1/8

4. Two numbers are selected at random from integers 1 through 9. If the sum is even, what is the probability that both numbers are odd?

(a) 5/8 (b) 1/6 (c) 4/9 (d) 2/3

5. A card is picked at random from a pack of 52 playing cards. Given that the picked card is a queen, the probability of this card to be a card of spade is

(a) 1/ 3 (b) 4/13 (c) 1/4 (d) 1/2

6. If A and B are two independent events with P(A) = 3/5 and P(B) = 4/9, then find $P(\overline{A}\cap\overline{B})$.

(a) 1/9 (b) 2/9 (c) 1/3 (d) 4/9

7. If P(A) = $\frac{4}{5}$, and P(A ∩ B) = $\frac{7}{10}$, then P(B | A) is equal to

(a) $\frac{1}{10}$ (b) $\frac{1}{8}$ (c) $\frac{7}{8}$ (d) $\frac{17}{20}$

8. If P(A) = 0.4, P(B) = 0.8 and P(B/A) = 0.6 then P(A U B) is equal to

(a) 0.24 (b) 0.3 (c) 0.48 (d) 0.96

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason(R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

9. Assertion (A): Given that E and F are events such that P(E) = 0.6, P(F) = 0.3 and P(E ∩ F) = 0.2, then P(E|F) = 2/3
Reason (R): Given that E and F are events such that P(E) = 0.6, P(F) = 0.3 and P(E ∩ F) = 0.2, then P(E|F) = 1/3

10. Assertion (A): Two coins are tossed simultaneously. The probability of getting two heads, if it is known that at least one head comes up, is $\frac{1}{3}$

Reason (R): Let A and B be two events with a random experiment then $P(A/B) = \frac{P(A \cap B)}{P(B)}$

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. A problem in Mathematics is given to three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$. Find the probability that the problem is solved.

12. The random variable X can take only the values 0, 1, 2, 3. Given that:
P(X = 0) = P(X = 1) = P and P(X = 2) = P(X = 3) such that $\sum P_i x_i^2 = 2\sum P_i x_i$, find the value of P.

13. An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement, then find the probability that both drawn balls are black.

14. In a hostel, 60% of the students read Hindi newspaper, 40% read English newspaper and 20% read both Hindi and English newspaper. A student is selected at random.
(a) If she reads Hindi newspaper, find the probability that she reads English newspaper.
(b) If she reads English newspaper, find the probability that she reads Hindi newspaper.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. In a group of 50 scouts in a camp, 30 are well trained in first aid techniques while the remaining are well trained in hospitality but not in first aid. Two scouts are selected at random from the group. Find the probability distribution of number of selected scouts who are well trained in first aid.

16. An urn contains 5 white and 8 white black balls. Two successive drawing of three balls at a time are made such that the balls are not replaced before the second draw. Find the probability that the first draw gives 3 white balls and second draw gives 3 black balls.

17. Two numbers are selected at random (without replacement) from first 7 natural numbers. If X denotes the smaller of the two numbers obtained, find the probability distribution of X.

SECTION – D

Questions 18 carry 5 marks.

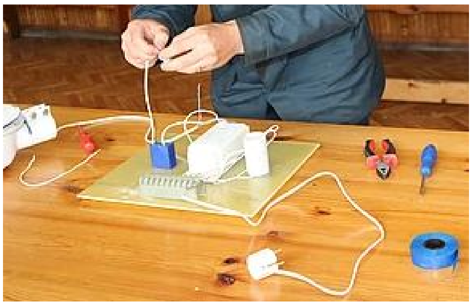
18. There are three coins, one is a two headed coin (having head on both the faces), another is a biased coin that comes up heads 75% of the time and the third is an unbiased coin. One of the three coins is chosen at random and tossed. If it shows head. What is probability that it was the two headed coin?

SECTION – E (Case Study Based Questions)

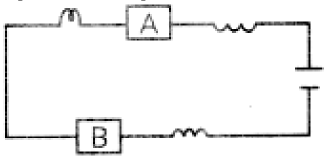
Questions 19 to 20 carry 4 marks each.

19. Case-Study 1: Read the following passage and answer the questions given below.
An electric circuit includes a device that gives energy to the charged particles constituting the current, such as a battery or a generator; devices that use current, such as lamps, electric motors, or

computers; and the connecting wires or transmission lines.



An electric circuit consists of two subsystems say A and B as shown below:



For previous testing procedures, the following probabilities are assumed to be known.
P(A fails) = 0.2, P(B fails alone) = 0.15, P(A and B fail) = 0.15
Based on the above information answer the following questions:
(a) What is the probability that B fails? [1]
(b) What is the probability that A fails alone? [1]
(c) Find the probability that the whole of the electric system fails? [2]

OR

Find the conditional probability that B fails when A has already failed. [2]

20. Case-Study 2: Read the following passage and answer the questions given below.

In a town, it's rainy one-third of the day. Given that it is rainy, there will be heavy traffic with probability 1/2. Given that it is not rainy, there will be heavy traffic with probability 1/4. If it's rainy and there is heavy traffic, I arrive late for work with probability 1/2. On the other hand, the probability of being late is reduced to 1/8 if it, is not rainy and there is no heavy traffic. In other situations (rainy and no heavy traffic, net rainy and heavy traffic), the probability of being late is 1/4. You pick a random day.

Based on the above information, answer the following questions:
(i) What is the probability that it's not raining and there is heavy traffic and I am not late?
(ii) What is the probability that I am late?
(iii) Given that I arrived late at work, what is the probability that it rained that day?

OR

(iii) If P(not A) = 0.7, P(B) = 0.7 and P(B/A) = 0.5, then find the P(A/B)