Sample Question Paper - 5

CLASS: XII

Session: 2021-22

Mathematics (Code-041)

Term - 1

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections - A, B and C. Each part is compulsory.
2. Section - A has 20 MCQs, attempt any 16 out of 20.
3. Section - B has 20 MCQs, attempt any 16 out of 20
4. Section - C has 10 MCQs, attempt any 8 out of 10.
5. There is no negative marking.
6. All questions carry equal marks.

Section A

Attempt any 16 questions

1. f : $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right] \rightarrow$ [-1, 1] : f(x) = sin x is **[1]**

a) many one and into
b) one one and into
c) many one and onto
d) one one and onto

2. Maximize Z = 100x + 120y , subject to constraints 2x + 3y ≤ 30, 3x + y ≤ 17, x ≥ 0, y ≥ 0. **[1]**

a) 1260
b) 1280
c) 1300
d) 1200

3. The derivative of $\cos^{-1}\left(2x^2 - 1\right)$ w.r.t. $\cos^{-1} x$ is **[1]**

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

4. If A is an invertible matrix of order 3, then which of the following information is NOT true? **[1]**

a) $(AB)^{-1} = B^{-1} A^{-1}$, where $B = [b_{ij}]_{3\times3}$ and $|B| \neq 0$
b) $(A^{-1})^{-1} = A$
c) $|adj\ A| = |A|^2$
d) If BA = CA, then $B \neq C$, where B and C are square matrices of order 3

5. The region represented by the inequation system x, y $\geq$ 0, y $\leq$ 6, x + y $\leq$ 3 is **[1]**

a) unbounded in first and second quadrants
b) bounded in first quadrant
c) None of these
d) unbounded in first quadrant

6. The function f(x) = $\frac{x}{1+|x|}$ is **[1]**

a) strictly increasing | b) strictly decreasing

c) none of these | d) neither increasing nor decreasing

7. For any 2-rowed square matrix A, if A · (adj A) = $\begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$ then the value of |A| is **[1]**

a) 8 | b) 4

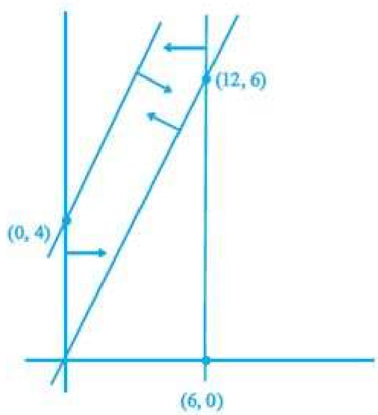
c) 0 | d) 64

8. If the function f(x) $= \begin{cases} \dfrac{1-\cos 4x}{8x^2}, x \neq 0 \\ k, x = 0 \end{cases}$ is continuous x = 0 then k = ? **[1]**

a) $\frac{-1}{2}$ | b) $\frac{1}{2}$

c) 2 | d) 1

9. The feasible region for an LPP is shown in the Figure. Let F = 3x - 4y be the objective function. Maximum value of F is. **[1]**



a) - 18 | b) 0

c) 8 | d) 12

10. If A = $\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A = A^T, then x is **[1]**

a) x = 0, y = 5 | b) none of these

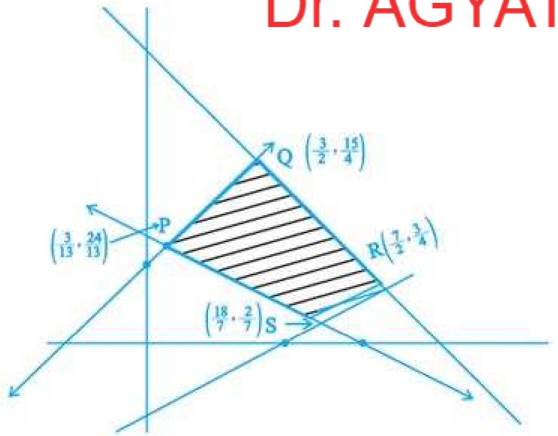
c) x = y | d) x + y = 5

11. If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$ then $\frac{dy}{dx}$ is equal to **[1]**

a) $\frac{4x^3}{1-x^4}$ | b) $\frac{-4x^3}{1-x^4}$

c) $\frac{1}{4-x^4}$ | d) $\frac{-4x}{1-x^4}$

12. In Figure, the feasible region (shaded) for a LPP is shown. Determine the maximum and minimum value of Z = x + 2y **[1]**



a) Maximum = 10, minimum = $3\frac{1}{4}$
b) Maximum = 8, minimum = $3\frac{1}{6}$
c) Maximum = 7, minimum = $3\frac{1}{9}$
d) Maximum = 9, minimum = $3\frac{1}{7}$

13. The minimum value of $f(x) = 3x^4 - 8x^3 - 48x + 25$ on [0, 3] is **[1]**

a) 25
b) 16
c) -39
d) None of these

14. In case of strict increasing functions, slope of the tangent and hence derivative is **[1]**

a) either positive or zero
b) zero
c) positive
d) negative

15. If $y = \frac{x}{2}\sqrt{x^2+1} + \frac{1}{2}\log(x + \sqrt{x^2+1})$, then $\frac{dy}{dx}$ is equal to **[1]**

a) $\sqrt{x^2+1}$
b) None of these
c) $2\sqrt{x^2+1}$
d) $\frac{1}{\sqrt{x^2+1}}$

16. The equation of the tangent to the curve $y^2 = 4ax$ at the point $(at^2, 2at)$ is **[1]**

a) $ty = x + at^2$
b) none of these
c) $tx + y = at^3$
d) $ty = x - at^2$

17. If f(x) = $\begin{cases} kx+5, \text{ when } x \le 2 \\ x+1, \text{ when } x > 2 \end{cases}$ is continuous at x = 2 then k = ? **[1]**

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

18. If $\tan^{-1} x + \tan^{-1} y = \frac{4\pi}{5}$ then $\cot^{-1} x + \cot^{-1} y$ equals **[1]**

a) $\frac{3\pi}{5}$
b) $\frac{\pi}{5}$
c) $\frac{2\pi}{5}$
d) π

19. If f(x) = |3 – x| + (3 + x), where (x) denotes the least integer **[1]**

a) neither differentiable nor continuous at x = 3
b) continuous but not differentiable at x = 3
c) differentiable but not continuous at x = 3
d) continuous and differentiable at x = 3

20. The equation of the normal to the curve y = x + sin x cos x at $x=\frac{\pi}{2}$ is **[1]**

a) x = 2

b) $x+\pi=0$

c) $2x=\pi$

d) x = π

Section B

Attempt any 16 questions

21. Let f(x) = $\frac{\sin^{-1}x}{x}$ Then , dom (f) = ? **[1]**

a) [-1,1] - {0}

b) none of these

c) [-1,1]

d) (-1,1)

22. If $y=\sqrt{\sin x+\sqrt{\sin x+\sqrt{\sin x+}}} \ldots\infty$ then $\frac{dy}{dx}$ = ? **[1]**

a) $\frac{\sin x}{(2y-1)}$

b) $\frac{\cos x}{(y-1)}$

c) $\frac{\cos x}{(2y-1)}$

d) None of these

23. The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5, 5), (15, 15), (0, 20). Let Z = px + qy, where p, q > 0. Condition on p and q so that the maximum of Z occurs at both the points (15, 15) and (0, 20) is **[1]**

a) q = 3p

b) q = 2p

c) p = q

d) p = 2q

24. If e^{x+y} = xy then $\frac{dy}{dx}=?$ **[1]**

a) $\frac{(x-xy)}{(xy-y)}$

b) none of these

c) $\frac{y(1-x)}{x(y-1)}$

d) $\frac{x(1-y)}{y(x-1)}$

25. If $f(x)=\begin{cases}\frac{\sin(\cos x)-\cos x}{(\pi-2x)^2} & ,x\neq\frac{\pi}{2}\\ k & ,x=\frac{\pi}{2}\end{cases}$ is continuous at $x=\frac{\pi}{2}$, then k is equal to **[1]**

a) 1

b) -1

c) 0

d) $\frac{1}{2}$

26. The value of cot $\left[\cos^{-1}\left(\frac{7}{25}\right)\right]$ is **[1]**

a) $\frac{25}{24}$

b) $\frac{24}{25}$

c) $\frac{7}{24}$

d) $\frac{25}{7}$

27. Consider the non – empty set consisting of children in a family and a relation R defined as aRb if a is brother of b. Then R is **[1]**

a) both symmetric and transitive

b) transitive but not symmetric

c) neither symmetric nor transitive

d) symmetric but not transitive

28. $\sin\left(\frac{1}{2}\cos^{-1}\frac{4}{5}\right)$ = ? **[1]**

a) $\frac{1}{\sqrt{10}}$

b) $\frac{2}{\sqrt{5}}$

c) $\frac{1}{\sqrt{5}}$

d) $\frac{2}{\sqrt{10}}$

29. Function $f(x) = 2x^3 - 9x^2 + 12x + 29$ is monotonically decreasing when **[1]**

a) $x > 2$

b) $1 < x < 2$

c) $x < 2$

d) $x > 3$

30. $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ = ? **[1]**

a) None of these

b) xy

c) (x - y)

d) (x + y)

31. If y = a sin mx + b cos m x, then $\frac{d^2y}{dx^2}$ is equal to **[1]**

a) my_1

b) None of these

c) $-m^2y$

d) m^2y

32. If $f(x) = |x^2 - 9x + 20|$, then f'(x) is equal to **[1]**

a) -2x + 9 for all $x \in R$

b) none of these

c) 2x - 9 if 4 < x < 5

d) -2x + 9 if 4 < x < 5

33. Tangents to the curve $x^2 + y^2 = 2$ at the points (1, 1) and (– 1, 1) **[1]**

a) at right angles

b) intersecting but not at right angles

c) none of these

d) parallel

34. The domain of the function $\cos^{-1}(2x - 1)$ is **[1]**

a) $[0, \pi]$

b) [–1, 1]

c) [0, 1]

d) (–1, 0)

35. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then det (adj(adj A)) is **[1]**

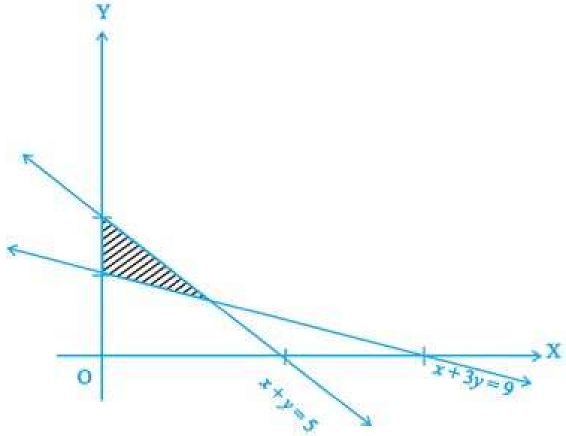
a) 14^3

b) 14

c) 14^4

d) 14^2

36. The feasible region for a LPP is shown in Figure. Find the minimum value of Z = 11x + 7y. **[1]**



a) 22

b) 21

c) 19

d) 20

37. If A and B are square matrices of same order and A' denotes the transpose of A, then **[1]**

a) AB = O $\Rightarrow$|A| = 0 and |B| = 0

b) (AB)' = A'B'

c) (AB)' = B'A'

d) AB = O $\Rightarrow$ A = 0 or B = 0

38. If $y=\sqrt{\frac{1+x}{1-x}}$ then $\frac{dy}{dx}=?$ **[1]**

a) $\frac{2}{(1-x)^2}$

b) $\frac{x}{(1-x)^{\frac{3}{2}}}$

c) None of these

d) $\frac{1}{(1-x)^{\frac{3}{2}}(1+x)^{\frac{1}{2}}}$

39. Let f be a function satisfying f(x + y) = f(x) + f(y) for all x, y $\in \mathbf{R}$,then f ' (x) = **[1]**

a) f (0) for all $x \in \mathbf{R}$

b) None of these

c) 0 for all $x \in \mathbf{R}$

d) f ' (0) for all $x \in \mathbf{R}$

40. A relation R is defined from {2, 3, 4, 5} to {3, 6, 7, 10} by x Ry $\Leftrightarrow$ x is relatively prime to y. Then, domain of R is **[1]**

a) {3, 5}

b) {2, 3, 4, 5}

c) {2, 3, 5}

d) {2, 3, 4}

Section C

Attempt any 8 questions

41. $\cos^{-1}(\cos \frac{2\pi}{3}) + \sin^{-1}(\sin \frac{2\pi}{3}) = ?$ **[1]**

a) π

b) $\frac{\pi}{3}$

c) $\frac{3\pi}{4}$

d) $\frac{4\pi}{3}$

42. The solution set of the inequation 2x + y > 5 is **[1]**

a) None of these

b) open half plane not containing the origin

c) half plane that contains the origin

d) whole xy-plane except the points lying on the line 2x + y = 5

43. f(x) = $|\log_e |x||$, then **[1]**

a) f(x) is continuous and differentiable for all x in its domain

b) f(x) is continuous for all x in its domain but not differentiable at x = ± 1

c) none of these

d) f(x) is neither continuous nor differentiable at x = ± 1

44. If $A=\begin{bmatrix}1 & \lambda & 2\\ 1 & 2 & 5\\ 2 & 1 & 1\end{bmatrix}$ is not invertible then $\lambda \neq ?$ **[1]**

a) 1

b) 2

c) 0

d) -1

45. The relation R in N $\times$ N such that (a, b) R (c, d) $\Leftrightarrow$ a + d = b + c is **[1]**

a) reflexive and transitive but not symmetric

b) an equivalence relation

c) reflexive but symmetric

d) none of these

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions:

Three car dealers, say A, B and C, deals in three types of cars, namely Hatchback cars, Sedan cars, SUV cars. The sales figure of 2019 and 2020 showed that dealer A sold 120 Hatchback, 50 Sedan, 10 SUV cars in 2019 and 300 Hatchback, 150 Sedan, 20 SUV cars in 2020; dealer B sold 100 Hatchback, 30 Sedan, 5 SUV cars in 2019 and 200 Hatchback, 50 Sedan, 6 SUV cars in 2020; dealer C sold 90 Hatchback, 40 Sedan, 2 SUV cars in 2019 and 100 Hatchback, 60 Sedan, 5 SUV cars in 2020.


46. The matrix summarizing sales data of 2019 is **[1]**

a) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 100 & 30 & 5 \\ 120 & 50 & 10 \\ 90 & 40 & 2 \end{bmatrix} \end{array}$

b) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 300 & 150 & 20 \\ 200 & 50 & 6 \\ 100 & 30 & 5 \end{bmatrix} \end{array}$

c) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 120 & 50 & 10 \\ 100 & 30 & 5 \\ 90 & 40 & 2 \end{bmatrix} \end{array}$

d) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 200 & 50 & 6 \\ 100 & 30 & 5 \\ 300 & 150 & 20 \end{bmatrix} \end{array}$

47. The matrix summarizing sales data of 2020 is **[1]**

a) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 300 & 150 & 20 \\ 200 & 50 & 6 \\ 100 & 60 & 5 \end{bmatrix} \end{array}$

b) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 200 & 50 & 6 \\ 100 & 60 & 5 \\ 300 & 150 & 20 \end{bmatrix} \end{array}$

c) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 120 & 50 & 10 \\ 100 & 60 & 5 \\ 90 & 40 & 2 \end{bmatrix} \end{array}$

d) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 100 & 60 & 5 \\ 120 & 50 & 10 \\ 90 & 40 & 2 \end{bmatrix} \end{array}$

48. The total number of cars sold in two given years, by each dealer, is given by the matrix **[1]**

a) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 300 & 80 & 11 \\ 190 & 100 & 7 \\ 420 & 200 & 30 \end{bmatrix} \end{array}$

b) $\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{matrix} Hatchback & Sedan & SUV \end{matrix} \\ \begin{bmatrix} 420 & 200 & 30 \\ 300 & 80 & 11 \\ 190 & 100 & 7 \end{bmatrix} \end{array}$

c) None of these

d)

$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} \textit{Hatchback} & \textit{Sedan} & \textit{SUV} \end{array} \\ \begin{bmatrix} 190 & 100 & 7 \\ 300 & 80 & 11 \\ 420 & 200 & 30 \end{bmatrix} \end{array}$$

49. The increase in sales from 2019 to 2020 is given by the matrix **[1]**

a) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} \textit{Hatchback} & \textit{Sedan} & \textit{SUV} \end{array} \\ \begin{bmatrix} 10 & 20 & 3 \\ 100 & 20 & 1 \\ 180 & 100 & 10 \end{bmatrix} \end{array}$

b) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} \textit{Hatchback} & \textit{Sedan} & \textit{SUV} \end{array} \\ \begin{bmatrix} 100 & 20 & 3 \\ 180 & 100 & 10 \\ 10 & 20 & 3 \end{bmatrix} \end{array}$

c) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} \textit{Hatchback} & \textit{Sedan} & \textit{SUV} \end{array} \\ \begin{bmatrix} 180 & 100 & 10 \\ 100 & 20 & 1 \\ 10 & 20 & 3 \end{bmatrix} \end{array}$

d) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} \textit{Hatchback} & \textit{Sedan} & \textit{SUV} \end{array} \\ \begin{bmatrix} 180 & 100 & 10 \\ 10 & 20 & 1 \\ 100 & 20 & 3 \end{bmatrix} \end{array}$

50. If each dealer receive profit of ₹ 50000 on sale of a Hatchback, ₹ 100000 on sale of a Sedan and ₹ 200000 on sale of an SUV, then the amount of profit received in the year 2020 by each dealer is given by the matrix. **[1]**

a) $\begin{array}{c} A \\ B \\ C \end{array}\begin{bmatrix} 34000000 \\ 16200000 \\ 12000000 \end{bmatrix}$

b) $\begin{array}{c} A \\ B \\ C \end{array}\begin{bmatrix} 12000000 \\ 16200000 \\ 34000000 \end{bmatrix}$

c) $\begin{array}{c} A \\ B \\ C \end{array}\begin{bmatrix} 30000000 \\ 15000000 \\ 12000000 \end{bmatrix}$

d) $\begin{array}{c} A \\ B \\ C \end{array}\begin{bmatrix} 15000000 \\ 30000000 \\ 12000000 \end{bmatrix}$

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