# INDIAN SCHOOL AL WADI AL KABIR

Practice Exam (2021-2022)-Term -I

Class: XII Sub: MATHEMATICS (041) Max Marks: 40

Date: 14.11.2021 Time: 90 minutes

**General Instructions:**

1. This question paper contains two parts A, B and C. Each part is compulsory.
2. Section A has 20 questions, attempt any 16 out of 20.
3. Section B has 20 questions, attempt any 16 out of 20.
4. Section C has 10 questions, attempt any 8 out of 10.
5. *There is no internal choice in any question and no negative marking.*
6. All questions carry equal marks.

***Section A***

***In this section, attempt any 16 questions out of Questions 1 – 20. Each Question is of 1-mark weightage***

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Q1.** | If $\sin^{-1}x = \sin^{-1}y = \sin^{-1}z = \frac{\pi}{2}$, then the value of $x + y^2 + z^3$ is | | | | | | | |
| | **A** | 1 | **B** | 2 | **C** | 3 | **D** | 4 |
| **Q2.** | Find the value of k for which the following function is continuous at x = 2<br>$f(x)= \begin{cases} 2x+1; & x < 2 \\ k; & x = 2 \\ 3x - 1; & x > 2 \end{cases}$ | | | | | | | |
| | **A** | -5 | **B** | 5 | **C** | 7 | **D** | -7 |
| **Q3.** | If A = $\begin{bmatrix} 1 & 2 & x \\ 3 & -1 & 2 \end{bmatrix}$ and B = $\begin{bmatrix} y \\ x \\ 1 \end{bmatrix}$ be such that AB = $\begin{bmatrix} 6 \\ 10 \end{bmatrix}$ then | | | | | | | |
| | **A** | y = 3x | **B** | y = - 3x | **C** | y = x | **D** | y = -x |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Q4.** | For what values of x and y the following matrices equal<br>P = $\begin{bmatrix} 2x+1 & 3y \\ 0 & y^2 - 5y \end{bmatrix}$ and Q = $\begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$ | | | | | | | |
| | **A** | 2, 3 | **B** | 3, 4 | **C** | 2, 2 | **D** | 3, 3 |
| **Q5.** | Find the intervals in which the function *f* given by *f* (*x*) = sin *x* + cos *x*, $0 \le x \le 2\pi$ is strictly decreasing | | | | | | | |
| | **A** | $\left(0, \frac{\pi}{4}\right)$ | **B** | $\left(\frac{\pi}{4}, \frac{5\pi}{4}\right)$ | **C** | $\left(\frac{5\pi}{4}, 2\pi\right)$ | **D** | none of these |
| **Q6.** | $\begin{vmatrix} x & sin\theta & cos\theta \\ -sin\theta & -x & 1 \\ cos\theta & 1 & x \end{vmatrix}$ = 27, then the value of x is | | | | | | | |
| | **A** | -2 | **B** | 2 | **C** | -3 | **D** | 5 |
| **Q7.** | Set A has 5 elements and the set B has 6 elements. Then the number of injective functions that can be defined from set A to set B is | | | | | | | |
| | **A** | 720 | **B** | 240 | **C** | 120 | **D** | 30 |
| **Q8.** | If A = $\begin{bmatrix} 1 & 0 & 1 \\ 0 & -1 & 2 \\ 4 & 0 & 0 \end{bmatrix}$, then $\lvert 3A \rvert$ is equal to | | | | | | | |
| | **A** | $3\lvert A \rvert$ | **B** | $9\lvert A \rvert$ | **C** | $27\lvert A \rvert$ | **D** | 0 |
| **Q9.** | The equation of the normal to the curve y $(1 + x^2)$ = 2 – x, where the tangent crosses the x axis is | | | | | | | |
| | **A** | x + 5y = 2 | **B** | 5x – y = 10 | **C** | x – 5y = 2 | **D** | 5x + y = 10 |
| **Q10.** | $\tan^{-1}\left[2cos\left(2sin^{-1}\frac{1}{2}\right)\right]$ is equal to | | | | | | | |
| | **A** | $\frac{\pi}{6}$ | **B** | $\frac{\pi}{2}$ | **C** | $\frac{\pi}{3}$ | **D** | $\frac{\pi}{4}$ |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Q11.** | Let us define a relation R in R as aRb if a $\geq$ b , then R is | | | | | | | |
| | **A** | an equivalence relation | | | **B** | reflexive, transitive but not symmetric | | |
| | **C** | symmetric, transitive but not reflexive | | | **D** | None of these | | |
| **Q12.** | If $f'(x)$ is the derivative of the function given by $f(x) = (1 + x)(1 + x^2)(1 + x^4)(1 + x^8)$ then $f'(1)$ is equal to | | | | | | | |
| | **A** | 100 | **B** | 120 | **C** | 140 | **D** | 0 |
| **Q13.** | If A, B are symmetric matrices of same order, then AB – BA is a | | | | | | | |
| | **A** | Skew symmetric matrix | | | **B** | Symmetric matrix | | |
| | **C** | Zero matrix | | | **D** | Identity matrix | | |
| **Q14.** | Derivative of log (log x)$^2$ with respect to x is | | | | | | | |
| | **A** | $\frac{2}{x\log x}$ | **B** | $\frac{1}{x\log x}$ | **C** | $\frac{-2}{x\log x}$ | **D** | $\frac{-1}{x\log x}$ |
| **Q15.** | A = $\begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, then the value of x satisfying $0 < x < \frac{\pi}{2}$ when A + A$^T$ = $\sqrt{2}$ $I_2$ is | | | | | | | |
| | **A** | $\frac{\pi}{6}$ | **B** | $\frac{\pi}{2}$ | **C** | $\frac{\pi}{3}$ | **D** | $\frac{\pi}{4}$ |
| **Q16.** | Find the point at which the tangent to the curve y = $\sqrt{8x^2 + 1}$ has its slope 2 | | | | | | | |
| | **A** | $\left(\frac{1}{8}, \mp\sqrt{2}\right)$ | **B** | $\left(\frac{1}{2\sqrt{2}}, \sqrt{2}\right)$ | **C** | $\left(\mp\frac{1}{2\sqrt{2}}, \sqrt{2}\right)$ | **D** | $\left(\frac{1}{2\sqrt{2}}, \mp\sqrt{2}\right)$ |
| **Q17.** | The number of all possible matrices of order 3 × 3 with each entry 0, 1 or 2 is: | | | | | | | |
| | **A** | 521 | **B** | 19386 | **C** | 512 | **D** | 19683 |
| **Q18.** | If y = $\sec^{-1}\left(\frac{\sqrt{x}+1}{\sqrt{x}-1}\right) + \sin^{-1}\left(\frac{\sqrt{x}-1}{\sqrt{x}+1}\right)$, then $\frac{dy}{dx}$ is equal to | | | | | | | |
| | **A** | 1 | **B** | $\frac{\sqrt{x}+1}{\sqrt{x}-1}$ | **C** | $\frac{\sqrt{x}-1}{\sqrt{x}+1}$ | **D** | 0 |

| | |
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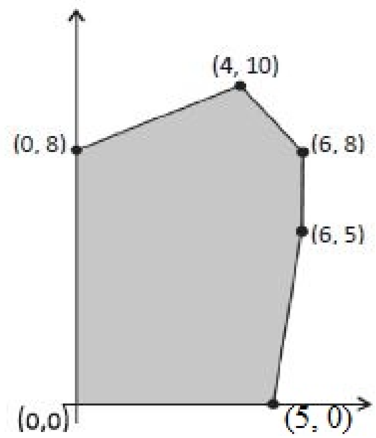
| **Q19.** | If the curve ay +$x^2$ = 7 and $x^3$ = y, cut orthogonally at (1, 1), then the value of 'a' is |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **A** | 1 | **B** | 6 | **C** | -6 | **D** | 0 |

**Q20.** The feasible solution for an LPP is shown in the given figure. If Z=2x- 7y be the objective function, then the Minimum of Z occurs at

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|---|---|---|---|---|---|---|---|---|
| | **A** | (4, 10) | **B** | (0, 0) | **C** | (0, 8) | **D** | (6,5) |

***Section B***

***In this section, attempt any 16 questions out of Questions 21 – 40. Each Question is of 1-mark weightage***

| | |
|---|---|
| **Q21.** | Let R be a relation on the set N of natural numbers denoted by nRm⇔ n divides m. Then, R is |

| | | | | |
|---|---|---|---|---|
| | **A** | Reflexive and symmetric | **B** | reflexive, transitive but not symmetric |
| | **C** | symmetric, transitive but not reflexive | **D** | None of these |

| | |
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| **Q22.** | If x = $\sqrt{a^{\sin^{-1} t}}$ and y = $\sqrt{a^{\cos^{-1} t}}$ , then $\frac{dy}{dx}$ is equal to |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **A** | $\frac{y}{x^2}$ | **B** | $\frac{-y}{x}$ | **C** | $\frac{x}{t^2}$ | **D** | $\frac{-y}{t^2}$ |

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| **Q23.** | The maximum value of the object function Z = 5x + 10y subject to the constraints x + 2y ≤ 120, x + y ≥ 60, x – 2y ≥ 0, x ≥ 0, y ≥ 0 is |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **A** | 300 | **B** | 400 | **C** | 600 | **D** | 800 |

| | | | | | | | | |
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| **Q24.** | The derivative of $tan^{-1}\left(\frac{sin\,x}{1+cosx}\right)$with respect to x is | | | | | | | |
| | **A** | $\frac{1}{2}$ | **B** | $\frac{-1}{2}$ | **C** | $\frac{\pi}{2}$ | **D** | $\frac{-\pi}{2}$ |
| **Q25.** | If A = $\begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and B = $\begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$, then | | | | | | | |
| | **A** | $A^{-1}$ = B | **B** | $A^{-1}$ = 6B | **C** | $B^{-1}$ = B | **D** | $B^{-1} = \frac{1}{6}$ A |
| **Q26.** | The total revenue in Rupees received from the sale of x units of a product is given by R(x) = $13x^2 + 26x + 15$, then the marginal revenue when x = 7 is | | | | | | | |
| | **A** | ₹ 208 | **B** | ₹ 206 | **C** | ₹ 228 | **D** | ₹ 200 |
| **Q27.** | The simplest form of $\tan^{-1}\left(\frac{cos\,x}{1-sin\,x}\right)$, where $\frac{-\pi}{2} < x < \frac{\pi}{2}$ is | | | | | | | |
| | **A** | $\frac{\pi}{4} - \frac{x}{2}$ | **B** | $\frac{\pi}{4} + \frac{x}{2}$ | **C** | $\frac{\pi}{2} + \frac{x}{2}$ | **D** | $\frac{\pi}{2}$ |
| **Q28.** | If X is square matrix such that $X^2 = X$, then $(I + X)^2 - 4X$ is equal to | | | | | | | |
| | **A** | X | **B** | I | **C** | I - X | **D** | 3X |
| **Q29.** | The interval in which y = $x^2\, e^{-x}$ is increasing is | | | | | | | |
| | **A** | (-∞, ∞) | **B** | (-2, 0) | **C** | (2, ∞ ) | **D** | (0, 2) |
| **Q30.** | If A= {p, q, r}, then the relation which is not an equivalence relation on A is | | | | | | | |
| | **A** | {(p, p), (q, q), (r, r)} | | | **B** | {(p, p), (q, q), (r, r), (p, q), (q, p)} | | |
| | **C** | {(p, p), (q, q), (r, r), (r, q), (q, r)} | | | **D** | none of these | | |
| **Q31.** | If f(x) = $\frac{\sqrt{2}\,cosx - 1}{cot\,x - 1}$, $x \neq \frac{\pi}{4}$, and f(x) is continuous at x = $\frac{\pi}{4}$, then the value of f $\left(\frac{\pi}{4}\right)$ is | | | | | | | |
| | **A** | $\frac{1}{2}$ | **B** | $\frac{-1}{2}$ | **C** | $\frac{\pi}{2}$ | **D** | $\frac{-\pi}{2}$ |

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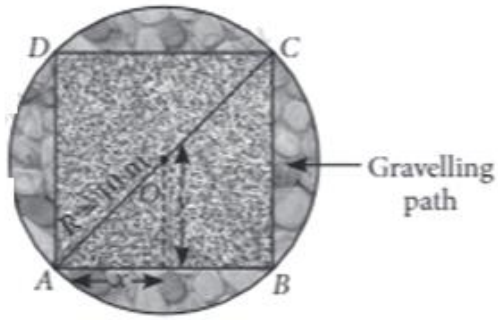
|---|---|---|---|---|---|---|---|---|
| **Q32.** | If A = $\begin{bmatrix} 1 & 2 & 4 \\ 1 & 3 & 5 \\ 1 & 4 & a \end{bmatrix}$ is singular, then the value of a is | | | | | | | |
| | **A** | -6 | **B** | 6 | **C** | 8 | **D** | 0 |
| **Q33.** | The linear programming problem minimize Z= 3x+2y, subject to constraints x + y $\geq$ 8, 3x+5y $\leq$15, and x, y $\geq$ 0, has | | | | | | | |
| | **A** | One solution | | | **B** | Two solutions | | |
| | **C** | No feasible solution | | | **D** | Infinitely many solutions | | |
| **Q34.** | The shortest distance between the line y – x = 1 and the curve x = $y^2$ is | | | | | | | |
| | **A** | $\frac{\sqrt{3}}{4}$ | **B** | $\frac{3\sqrt{2}}{8}$ | **C** | $\frac{2\sqrt{3}}{8}$ | **D** | $\frac{3\sqrt{2}}{5}$ |
| **Q35.** | If A = $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ and f(x) = (1 + x)(1 – x), then f(A) is | | | | | | | |
| | **A** | -4 $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ | **B** | 4 $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ | **C** | 8 $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ | **D** | -8 $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ |
| **Q36.** | $\sin\left(2tan^{-1}\frac{1}{3}\right) + \cos\left(tan^{-1}2\sqrt{2}\right)$ is equal to | | | | | | | |
| | **A** | $\frac{-14}{15}$ | **B** | $\frac{15}{14}$ | **C** | $\frac{-15}{14}$ | **D** | $\frac{14}{15}$ |
| **Q37.** | If f: R $\rightarrow$ R is a function defined as f(x) = $\frac{1}{3-\text{Cosx}}$, $\forall$ x $\in$ R, then the range of f is, | | | | | | | |
| | **A** | (-1, 1) | **B** | [-2, -1] | **C** | $\left[\frac{1}{3}, 1\right]$ | **D** | $\left[\frac{1}{4}, \frac{1}{2}\right]$ |
| **Q38.** | If A = $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then $A^{2021}$ is equal to | | | | | | | |
| | **A** | $2^{2020}$ A | **B** | $2^{2020}$ I | **C** | I | **D** | 0 |
| **Q39.** | A particle moves along the curve 6*y* = $x^3$ +2. Find the points on the curve in the first quadrant at which the *y*-coordinate is changing 8 times as fast as the *x*-coordinate. | | | | | | | |
| | **A** | (11, 11) | **B** | (11, 4) | **C** | (4, 11) | **D** | (4, 4) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Q40.** | If A = $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, then $A^n$ + nI is equal to | | | | | | | |
| | **A** | I | **B** | nA | **C** | I + nA | **D** | I - nA |
| ***Section C*** <br> ***In this section, attempt any 8 questions. Each question is of 1-mark weightage.*** <br> ***Questions 46-50 are based on a Case-Study.*** | | | | | | | | |
| **Q41.** | Corner points of the feasible region determined by the system of linear constraints are (0, 3), (1,1) and (3,0). Let Z= p x + q y, where p, q > 0. Condition on p and q so that the minimum of Z occurs at (3,0) and (1,1) is | | | | | | | |
| | **A** | p=2q | **B** | P = $\frac{q}{2}$ | **C** | q = $\frac{p}{2}$ | **D** | p=q |
| **Q42.** | If a tangent to the curve $y^2 + 3x - 7 = 0$ at the point (h, k) is parallel to the line x – y = 4, then the value of ‘k’ is | | | | | | | |
| | **A** | $\frac{-3}{2}$ | **B** | $\frac{3}{2}$ | **C** | $\frac{-2}{3}$ | **D** | $\frac{2}{3}$ |
| **Q43.** | A square piece of tin of side 18 cm is to be made into a box without top, by cutting a square from each corner and folding up the flaps to form the box. What should be the side of the square to be cut off so that the volume of the box is the maximum possible | | | | | | | |
| | **A** | 9 cm | **B** | 7 cm | **C** | 1 cm | **D** | 3 cm |
| **Q44.** | Corner points of the feasible region for an LPP are (0,2), (3,0), (6,0), (6,8) and (0,5). If F=4x+6y be the objective function, then Maximum of F – Minimum of F is equal to | | | | | | | |
| | **A** | 72 | **B** | 60 | **C** | 24 | **D** | 30 |
| **Q45.** | If A = $\begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$, is a symmetric matrix, then x is equal to | | | | | | | |
| | **A** | -3 | **B** | 4 | **C** | -4 | **D** | 3 |

## CASE STUDY QUESTION

In a park there is a green garden in the shape of rectangle inscribed in a circle of radius 10 m as shown in the given figure.




Based on the above information answer the following questions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Q46.** | If 2x and 2y denotes the length and breadth in meters, of the rectangular part, then the relation between the variables is | | | | | | | |
| | **A** | $x^2 - y^2 = 10$ | **B** | $x^2 + y^2 = 10$ | **C** | $x^2 + y^2 = 100$ | **D** | $x^2 - y^2 = 100$ |
| **Q47.** | The area (A) of green grass, in terms of x, is given by | | | | | | | |
| | **A** | $2x\sqrt{100 - x^2}$ | **B** | $4x\sqrt{100 - x^2}$ | **C** | $2x\sqrt{100 + x^2}$ | **D** | $4x\sqrt{100 + x^2}$ |
| **Q48.** | The maximum value of A is | | | | | | | |
| | **A** | 100 $m^2$ | **B** | 200 $m^2$ | **C** | 400 $m^2$ | **D** | 1600 $m^2$ |
| **Q49.** | The length of the rectangle, when the area is maximum, is | | | | | | | |
| | **A** | $10\sqrt{2}$ m | **B** | $20\sqrt{2}$ m | **C** | 20 m | **D** | $5\sqrt{2}$ m |
| **Q50.** | The area of the gravelling path is | | | | | | | |
| | **A** | $100(\pi + 2)$ $m^2$ | **B** | $200(\pi + 2)$ $m^2$ | **C** | $100(\pi - 2)$ $m^2$ | **D** | $200(\pi - 2)$ $m^2$ |

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ANSWERS

| Q. No | **Option** | Q. No | **Option** | Q. No | **Option** | Q. No | **Option** | Q. No | **Option** |
|---|---|---|---|---|---|---|---|---|---|
| 1. | **C** | 11. | **B** | 21. | **B** | 31. | **A** | 41 | **B** |
| 2. | **B** | 12. | **B** | 22. | **B** | 32. | **B** | 42 | **A** |
| 3. | **A** | 13. | **A** | 23. | **C** | 33. | **C** | 43 | **D** |
| 4. | **C** | 14. | **A** | 24. | **A** | 34. | **B** | 44 | **B** |
| 5. | **B** | 15. | **D** | 25. | **D** | 35. | **A** | 45 | **C** |
| 6. | **C** | 16. | **C** | 26. | **A** | 36. | **D** | 46 | **C** |
| 7. | **A** | 17. | **D** | 27. | **B** | 37. | **D** | 47 | **B** |
| 8. | **C** | 18. | **D** | 28. | **C** | 38. | **A** | 48 | **B** |
| 9. | **B** | 19. | **B** | 29. | **D** | 39 | **C** | 49 | **A** |
| 10. | **D** | 20 | **A** | 30. | **D** | 40 | **C** | 50 | **C** |

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