LIONS SCHOOL MIRZAPUR

PRE- BOARD EXAMINATION 2021-22

TERM- I

CLASS: XII MAXIMUM MARKS: 40

SUBJECT: MATHEMATICS (041) TIME: 90 MINUTES

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

In this section, attempt any 16 questions out of 1 – 20. Each question is of 1 mark weightage.

Q1. The value of $\tan^{-1}(-1)+\cos^{-1}(\frac{-1}{\sqrt{2}})$ is

a) π b) $\frac{3\pi}{2}$ c) $\frac{\pi}{2}$ d) none of these

Q2. If $\sin^{-1}x+\sin^{-1}y=\frac{2\pi}{3}$ then $\cos^{-1}x + \cos^{-1}y$=?

a) $\frac{\pi}{6}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{4}$ d) none of these

Q3. the value of $\tan^{-1}(\tan\frac{7\pi}{2}$¿ is

a) $\frac{7\pi}{6}$ b) $\frac{5\pi}{6}$ c) $\frac{\pi}{6}$ d) none of these

Q4. Let R={(a,b): a,b are natural numbers and b = a + 5,a<4 range of R is

a) {6,7,8} b) {6,7,8,9} c) {5,6,7,8} d) none of these

Q5. The function f: N→R given by $f(x) = x^2$ is

a) one-one into b) many one into

c) one-one onto d) none of these

Q6. The range of function f(x) = ${}^{7-x}P_{x-3}$ is

a) {1,2,3} b) {6,7,8,9} c) {1,2,3,4} d) none of these

Q7. Solve the following matrix equation for x: $[2x \quad 4]\begin{bmatrix} x \\ -8 \end{bmatrix} = O$

a¿ $x=\pm 8$ b) $x=\pm 4$ c) $x=\pm 16$ d) none of these

Q8. Evaluate $\begin{vmatrix} \cos 15^0 & \sin 15^0 \\ \sin 75^0 & \cos 75^0 \end{vmatrix}$

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

Q9. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$, find the value of 2x-y.

a) 17 b) 10 c) 9 d) none of these

Q10. The matrix A = $\begin{bmatrix} 0 & -5 & 8 \\ 3 & 0 & -4 \\ 10 & 12 & 0 \end{bmatrix}$ is a

a) Diagonal matrix b) symmetric matrix

c) skew-symmetric matrix d) scalar matrix

Q11. If points (x,-2), (5,2) and (8,8) are collinear, find x using determinants

a) 3 b) -3 c) 4 d) none of these

Q12. A square matrix A is called singular, if

a) $|A|\neq 0$ b) |A|=0 c) |adjA|=0 d) none of these

Q13. If A = $\begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that A^{-1} = kA, then k equals

a) 19 b) 1/19 c) -19 d) none of these

Q14. Let f(x) = |x| + |x+|, thex

a) f(x) is continuous at x=0, as well as x=1

b) f(x) is continuous at x=0, as but not at x=1

c) f(x) is continuous at x=1, but not at x=0

d) none of these

Q15. The function $f(x)=\begin{cases} \frac{\sin 3x}{x}, \wedge x\neq 0 \\ \frac{k}{2}, \wedge x=0 \end{cases}$ is continuous at x=0, then k=

a) 3 b) 6 c) 9 d) none of these

Q16. If f(x) = |cosx| then value of f′ ($\frac{\pi}{4}$) is

a) $\frac{-1}{\sqrt{2}}$ b) $\frac{1}{\sqrt{2}}$ c) $\frac{3}{\sqrt{2}}$ d) none of these

Q17. If y = $\tan^{-1}\{\frac{2^{x+1}}{1-4^x}\}$, $-\infty<x<0$, then $\frac{dy}{dx}$ is equal to

a) $\frac{2^{x+1}\log 2}{1+4^x}$ b) $\frac{2^{x+1}\log 2}{1-4^x}$ c) $\frac{2^{x+1}}{1-4^x}$ d) none of these

Q18. If x = 2at, y = at^2, where a is constant, then(d^2y/dx^2) at x=1/2 is

a) 1 b) 1/2a c) 2a d) none of these

Q19. If y = A cos nx + B sin nx, then value of $d^2y/dx^2 + n^2y$ =?

a) 1 b) 1/2 c) 0 d) none of these

Q20. If $x^x = y^x = 1$ then $\frac{dy}{dx}$ =

a) $\frac{-y(y+x\log y)}{x(y\log x+x)}$ b) $\frac{y(y+x\log y)}{x(y\log x+x)}$ c) $\frac{-x(y+x\log y)}{y(y\log x+x)}$ d) none of these

SECTION – B

In this section, attempt any 16 questions out of 1 – 20. Each question is of 1 mark weightage.

Q21. The equation to the normal to the curve y = sin x at (0,0) is

a) X=1 b) x+y=0 c) y= 0 d) none of these

Q22. The point on the curve $y = x^2 - 3x + 2$ where tangent tangent is perpendicular to y = x is

a) (1,0) b) (2,0) c) (0,0) d) none of these

Q23. The curves $y = a e^x$ and $y = b e^{-x}$ cut orthogonally, if

a) a = b b) a + b=0 c) ab = 1 d) none of these

Q24. Function $f(x) = 2x^3 - 9x^2 + 12x + 29$ is monotonically decreasing when

a) x ¿2 b) x¿2 c) 1¿x¿2 d) none of these

Q25. The point on curve $y^2 = 4x$ which is nearest to the point (2,1) is

a) $(1,2\sqrt{2})$ b) (2,1) c) (1,2) d) none of these

Q26. Let R be the relation on the set N of the natural numbers defined by nRm iff n divides m. then R is

a) Reflective and symmetric b) transitive and symmetric

c) Reflective, transitive but symmetric d) Equivalence

Q27. If set A contains 5 elements and set B contains 6 elements, then the number of one-one onto mappings from A to B is

a) 720 b) 120 c) 0 d) none of these

Q28. Evaluate the determinant $\begin{vmatrix} 41 & 1 & 5 \\ 79 & 7 & 9 \\ 29 & 5 & 3 \end{vmatrix}$. Its value is

a) 20 b) 10 c) 0 d) none of these

Q29. If A be an invertible matrix, then $\det(A^{-1})$ is equal to

a) det(A) b) $\frac{1}{det(A)}$ c) 1 d) none of these

Q30. If $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 3 \\ 0 & -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 2 & -6 \\ -2 & 1 & -3 \\ -4 & 2 & 5 \end{bmatrix}$, then

a) $A^{-1}=\frac{1}{11}B$ b) $A^{-1}=\frac{1}{8}B$ c) A=11B d) none of these

Q31. If A and B are invertible matrices of same order then $(AB)^{-1}$ =?

a) $(A^{-1} \times B^{-1})$ b) $(B^{-1} \times A^{-1})$ c) $(A \times B^{-1})$ d) none of these

Q32. Object function of a LPP is

a) a constraint b) a function to be optimized

c) a relation between the variables d) none of these

Q33. Value of $\cot(\tan^{-1} x + \tan^{-1} y)$ = ?

a) $\frac{3\pi}{2}$ b) $\frac{\pi}{3}$ c) 0 d) none of these

Q34. If A is a square matrix of order 3x3, $|A| \neq 0$ and $|3A| = k|A|$, then write the value of k.

a) 27 b) 9 c) 3 d) none of these

Q35. If $\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$, xy¿1, then write the value of x+y+xy.

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

Q36. If $y = \sqrt{x+\sqrt{x+\sqrt{x+\ldots\ldots\ldots\infty}}}$ then $\frac{dy}{dx}$ =

a) $\frac{1}{2y-1}$ b) $\frac{1}{\sqrt{y^2-1}}$ c) $\frac{2y}{y^2-1}$ d) none of these

Q37. The maximum value of $f(x) = (x-2)(x-3)^2$ is

a) $\frac{7}{3}$ b) $\frac{4}{27}$ c) 3 d) none of these

Q38. $f(x) = x^x$ is decreasing in the interval

a) (0,1/e) b) (0,e) c) (0,1) d) none of these

Q39. A function is called even function if

a) $f(-x) = -f(x)$ b) $f(-x) = f(x)$ c) $f(-x) = \{f(x)\}^2$ d) none of these

Q40. If $y = \sin^{-1}\left\{\frac{5x+12\sqrt{1-x^2}}{13}\right\}$, then $\frac{dy}{dx}$ is equal to

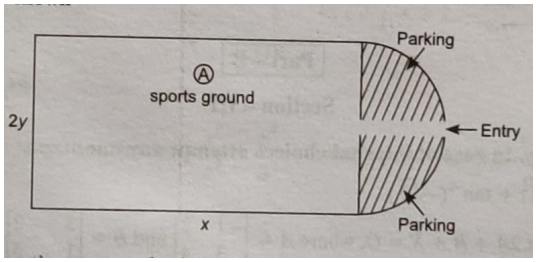
a) $\frac{1}{x^2-1}$ b) $\frac{-1}{\sqrt{1-x^2}}$ c) $\frac{2x}{1-x^2}$ d) none of these

SECTION – C

Both the case study-based questions are compulsory. Attempt any 4 sub parts from each question. Each sub parts question carries one mark.

Case study 1.

The government of a state, which has mostly hilly area decided to have adventurous play ground on the top of hill having plane area and the space for 10,000 persons to sit at a time. After survey it was decided to have rectangular playground with a semicircular parking at one end of playground only as space is less. The total perimeter of the field is measured as 1000 m as shown.



Based on the above information answer the following.

Q41. Looking at the figure (plane) the relation between x and y is

a). $x + 2y + \pi y = 1000$

b). $x + 2y + \pi y = 500$

c). $2x + 2y + \pi y = 1000$

d). none of these.

Q42. The area of sports ground expressed as a function x is

a). $\frac{2}{\pi+2}(1000x - 2x^2)\ m^2$

b). $\frac{1}{\pi}(1000x - 2x^2)\ m^2$

c). $\frac{2}{\pi+2}(500x - 2x^2)\ m^2$

d). none of these.

Q43. The maximum area of sports ground is for x equal to

a). 100 m

b). 500 m

c). 50 m

d). 250m

Q44. The government wants to maximize the area including parking area for this to happen, value of y is

a). $\frac{1000}{\pi+4}$ m

b). $\frac{2000}{\pi+4}$ m

c). $\frac{500}{\pi+4}$ m

d). none of these.

Q45. What is the maximum area of sports field alone?

a). $\frac{90000}{\pi+2}$$m^2$

b). $\frac{160000}{\pi+2}$ m^2

c). $\frac{250000}{\pi+2}$ m^2

d). none of these.

Case study 2.

Mr Dass want to invest Rs12000 in Public Provident fund (PPF) and in National Bonds. He has to invest at least Rs1000 in PPF and at least Rs2000 in bonds. If the rate of interest on PPF is 12% per annum and that on bonds is 15% per annum, assume that Mr. Dass invest Rs x in Public Provident fund (PPF) and Rs y in National Bonds.

Based on the above information formulate LPP answer the following

Q46. The objective function for given information is

a). $Z = \frac{12x}{100} + \frac{15y}{100}$

b). $Z = \frac{15x}{100} + \frac{12y}{100}$

c). $Z = \frac{12x}{100} - \frac{15y}{100}$

d). none of these.

Q47. Maximum amount of investable money by Mr Dass

a). Rs1000

b). Rs11000

c). Rs12000

d). none of these.

Q48. How should he invest the money to earn maximum annual in income?

a). Rs10000 in PPF and Rs2000 in bonds.

b). Rs1000 in PPF and Rs11000 in bonds.

c). Rs2000 in PPF and Rs10000 in bonds.

d) none of these.

Q49. Maximum annual income earn by Mr Dass is

a). Rs 1770

b). Rs 1700

c). Rs 1870

d). none of these.

Q50. Objective of such type of investments

a). to become a richest person

b). to secure future with National interest

c). to become a strongest person

d). none of these.