SET NO - 3

Exam ID. | | | | | | |

Candidates must write the Set No. on the title page of the OMR Sheet.

DAV PUBLIC SCHOOLS,ODISHA ZONE –I
PA-II EXAMINATION, 2021-22

- **Check that this question paper contains 7 printed pages.**
- **Set number given on the right hand side of the question paper should be written on the OMR SHEET by the candidate.**
- **Check that this question paper contains 50 questions.**

Class-XII
SUB : MATHEMATICS(041)

Time : 90 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

(Section A consists of 20 questions of each 1mark weightage. Any 16 questions are to be attempted. The first attempted 16 questions would be evaluated.)

Q1. Find the principal value of

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

A) $\frac{\pi}{2}$ B) π C) $\frac{3\pi}{2}$ D) 2π

Q2. Let f be defined on [-5 , 5] as 1

$f(x)=\begin{cases} x \text{, if } x \text{ is rational} \\ -x \text{, if } x \text{ is irrationl} \end{cases}$

then $f(x)$ **is**

A) continuous at every x except $x=0$
B) discontinuous at every x except $x=0$
C) continuous everywhere
D) discontinuous everywhere.

Q3. If $A=\lfloor a_{ij}\rfloor_{nxn}$ **and** $a_{ij}=i^2-j^2$ **then** A **is**

A) Unit matrix B) Symmetric matrix 1
C) Skew symmetric matrix D) Null matrix

Q4. Find the values of x **and** y **respectively such that**

$\begin{bmatrix} x-y & 3 \\ 2x-y & 2x+1 \end{bmatrix}=\begin{bmatrix} 5 & 3 \\ 12 & 15 \end{bmatrix}$ 1

A) 2,7 B) 3,4 C) 7,2 D) 4,3

Q 5. If $f(x)=x^3-6x^2+9x+3$ **be a decreasing function then** x **lies in**

A) $(-\infty,-1)\cap(3,\infty)$ B) (1 ,3) C) $(3,\infty)$ D) None of these 1

Q 6. If A , B, C are square matrices of order 3 such that $|A|$**=3 ,** $|B|$**= -1,** $|C|=2$**, then** $|2ABC|$ **is** 1

A) 48 B) -48 C) -12 D) 436

Q7. Let R be a relation defined on the set Z of all integers such that $xRy \Leftrightarrow x+2y$ is divisible by 3**. Then** 1

A) R is transitive only. B) R is symmetric only.
C) R is an equivalence relation D) R is not an equivalence relation

Q 8. If $xy=e-e^y$ then $\left.\frac{dy}{dx}\right|_{x=0}=$ 1

A) $\frac{1}{e}$ B) $\frac{1}{e^2}$ C) $\frac{-1}{e}$ D) None of these

Q 9. **The slope of the normal to the curve** $x = a\sin t$, $y = a\left(\cos t + \log\tan\frac{t}{2}\right)$ **at the point 't' is** 1

A) tan t B) – tan t C) cot t D) –cot t

Q10. **Thevalue of x which satisfies the equation** $\tan^{-1} x = \sin^{-1}\left(\frac{3}{\sqrt{10}}\right)$ **is** 1

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) 3 D) None of these

Q11. **The number of equivalence relations on the set** $A = \{1,2,3\}$ **containing (1,3) and (3 ,1) is** 1

A) 1 B) 2 C) 3 D) 5

Q12. **The values of** x **for which** $\begin{bmatrix}1 & x & 1\end{bmatrix}\begin{bmatrix}1 & 3 & 2\\ 2 & 5 & 1\\ 15 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\ 2\\ x\end{bmatrix} = 0$ **are** 1

A) -1,12 B) -3,5 C) -2,-14 D) None of these

Q13. **If** A **and** B **are square matrices such that** $AB = B$ **and** $BA = A$ **then** $A^2 + B^2$ **is always equal to** 1

A) $2AB$ B) $2BA$ C) $A + B$ D) AB

Q14. **A curve is represented parametrically by the equations** $x = 4t^3 + 3$ **,** $y = 4 + 3t^4$**, then** $\frac{d^2x}{dy^2}$ **is** 1

A) $\frac{1}{t}$ B) $\frac{-1}{12t^5}$ C) 1 D) None of these

Q15. **If** $A = \begin{bmatrix}0 & 1 & -1\\ 2 & 1 & 3\\ 3 & 2 & 1\end{bmatrix}$ **then** $\left(A(adjA)A^{-1}\right)A$ **equals to** 1

A) $2\begin{bmatrix}3 & 0 & 0\\ 0 & 3 & 0\\ 0 & 0 & 3\end{bmatrix}$ B) $\begin{bmatrix}-6 & 0 & 0\\ 0 & -6 & 0\\ 0 & 0 & -6\end{bmatrix}$

C) $\frac{1}{6}\begin{bmatrix}0 & 1 & -1\\ 2 & 1 & 3\\ 3 & 2 & 1\end{bmatrix}$ D) None of these

Q16. **If** $y = 4x - 6$ **is a tangent to the curve** $y^2 = ax^4 + b$ **at (3 ,6),then** 1

A) $a = \frac{4}{9}, b = \frac{-4}{9}$ B) $a = 0, b = \frac{4}{9}$ C) $a = \frac{4}{9}, b = 0$ D) None of these

Q 17. **If** $y = e^{\frac{1}{2}\log\left(1+\tan^2 x\right)}$ **then** $\frac{dy}{dx}$ **is equal to** 1

A) $\frac{1}{2}\sec^2 x$ B) $\sec^2 x$ C) $\sec x \tan x$ D) $\log(\sec x + \tan x)$

Q18. **If** $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix} = 8$**, then value of** x **is** 1

A) 2 B) -2 C) 4 D)-4

Q19. **If** $f(x) = a\log|x| + bx^2 + x$ **has extreme values at** x **=-1 and** x**=2 then values of a and b are** 1

A) a= -1 ,b=2 B) a=2, b=-1

C) a=0 , b=2 D) a=2 , b=$\frac{-1}{2}$

Q 20. **The linear programming problem, To minimize** $Z = 3x + 2y$ **Subject to constraints** $x + y \geq 8, 3x + 5y \leq 15, x \geq 0$ and $y \geq 0$ **has**

A) One solution B) No feasible region

C) Two solutions D) Infinitely many solutions

SECTION – B

(Section B consists of 20 questions (21 – 40) of each 1mark weightage. Any 16 questions are to be attempted. The first attempted 16 questions would be evaluated.)

Q21 **If** $A = \{1,2,3,4\}$ **,** $B = \{a,b,c\}$ **then the number of functions from A to B which are not surjective is** 1

A) 8 B) 24 C) 45 D) 36

Q22. **If** $y = \sqrt{\sin x + y}$ **then** $\frac{dy}{dx}$ **is equal to** 1

A) $\frac{\cos x}{2y-1}$ B) $\frac{\cos x}{1-2y}$ C) $\frac{\sin x}{1-2y}$ D) $\frac{\sin x}{2y-1}$

Q23. **Corner points of the feasible region determined by the system of linear constraints are (0, 3), (1, 1) and (3, 0).** 1
Let Z = px+qy, where p, q > 0. Condition on p and q so that the minimum of Z occurs at (3, 0) and (1, 1) is

(A) p = 2q (B) 2p = q (C) p = 3q (D) p = q

Q24. **The derivative of** $\cos^{-1}(2x^2 - 1)$ **w.r.t.** $\cos^{-1} x$ **is** 1

(A) 2 (B) $\frac{-1}{2\sqrt{1-x^2}}$ (C) 2 x (D) $1 - x^2$

Q25. **If** $A = \begin{bmatrix} 4 & 3 \\ 5 & -4 \end{bmatrix}$ **and** $A^{-1} = kA$**, then 'k' is equal to** 1

(A) $\frac{-1}{31}$ (B) $\frac{1}{31}$ (C) 1 (D) None

Q26. **The function** $f(x) = \tan^{-1}(\sin x + \cos x)$ **is an increasing function in** 1

(A) $\left(0, \frac{\pi}{2}\right)$ (B) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ (C) $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$ (D) $\left(\frac{-\pi}{2}, \frac{\pi}{4}\right)$

Q27. **Express in simplest form** $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$ 1

A) $\frac{\pi}{4}-\frac{x}{2}$ B) $\frac{\pi}{4}+\frac{x}{2}$ C) $\frac{x}{2}$ D) $\frac{\pi}{4}-x$

Q28. **If matrix** $A=\begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ **is a symmetric matrix, then the values of a and b are** 1

A) $a=\frac{-2}{3}$, $b=\frac{3}{2}$ B) $a=\frac{2}{3}$, $b=\frac{-3}{2}$

C) a=2 , b= -3 D) none of these

Q29. **Maximum slope of the curve** $y=-x^3+3x^2+9x-27$ **is**

A) 0 B) 12 C)16 D)32 1

Q30. **The relation R in the set of natural numbers N defined as** $R=\{(x,y): y=x+7 \text{ and} x<5\}$ **is** 1

A) Reflexive B) Symmetric

C) Transitive D) Equivalence relation

Q 31. **The value of** λ **for which the matrix** $A=\begin{bmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ **is singular is** 1

A) 3 B) 5 C) -4 D) 4

Q32. **If** $f(x)=\begin{cases} \frac{\tan 5x}{x^2+2x}, x\neq 0 \\ k+\frac{1}{2}, x=0 \end{cases}$ **is continuous at x=0, then the value of k is** 1

A) 1 B) -2 C) 3 D)2

Q 33. **The profit function P which yields the values 61 and 57 at (4, 7) and (5,6) respectively is** 1

A) $2x+5y$ B) $7x+3y$ C) $5x+2y$ D) $3x+7y$

Q34. **The point of the parabola** $y^2=64x$ **which is nearest to the line** $4x+3y+35=0$ **is** 1

A) (9,-24) B) (1,81) C) (4,16) D) (-9,-24)

Q 35. **Let** $A=\begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix}$ **and** $f(x)=x^2+x-1$ **then** $f(A)$ **is** 1

A) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 3 \\ 3 & 6 \end{bmatrix}$

C) $A=\begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix}$ D) $A=\begin{bmatrix} 3 & 0 \\ 3 & 6 \end{bmatrix}$

Q36. **The domain of the function** $f(x)=\sin^{-1}\sqrt{x-1}$ **is**

A) [1,2] B) [-2,1] C) [-1,1] D) [0,1] 1

Q 37. **The greatest integer function** $f: R \to R$ **given by** $f(x) = [x]$ **is**

A) injective B) surjective C) bijective D) None of these 1

Q 38. **The total number of matrices of order 2x3 whose each entry is 0 or 2 is** 1

A) 12 B) 36 C) 64 D) 32

Q39. **If the curve** $ay + x^2 = 7$ and $x^3 = y$ **cut orthogonally at (1,1) then the value of 'a'is** 1

A) 1 B) 0 C) -6 D) 6

Q 40. **If** $P = \begin{bmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$ **is the adjoint of a square matrix B of order 3 and** 1

$|B| = 4$ then α is equal to

A) 4 B) 6 C) 9 D) 11

SECTION – C

(Section C consists of 10 questions of each 1mark weightage. Any 08 questions are to be attempted. Questions 46 – 50 are based on a Case- Study. The first attempted 08 questions would be evaluated.)

Q41. **If A is a square matrix such that A^2=I and (A+I)^3+(A-I)^3=kA+mI where I will be the identity matrix then the values of k ,m are** 1

A) K=8, m=1 B) K= 7 , m=1 C) K=8,m=0 D) K=7 ,m=0

Q42. **The absolute maximum value of the function f given by** $f(x) = 12x^{\frac{4}{3}} - 6x^{\frac{1}{3}}, x \in [-1,1]$ is 1

A) 18 B) 16 C) 14 D) $\frac{1}{8}$

Q 43 **The tangent to the curve** $y = e^{2x}$ **at the point (0,1) meets X-axis at** 1

A) (0,1) B)(-0.5 ,0) C) (2,0) D) (0,2)

Q44. **In a linear programming problem, the constraints in the decision variable x and y are** $x + y \le 6, x + 3y \ge 9, x \ge 0, y \ge 0$. **Corner points of feasible regions are** 1

A) $(0,3),(0,0),(6,0)$ B) $\left(\frac{9}{2},\frac{3}{2}\right),(9,0),(6,0)$

C) $\left(\frac{9}{2},\frac{3}{2}\right),(0,3),(0,6)$ D) None of these

Q45. **Corner points of the feasible region for a LPP are $(3,0),(0,2),(6,0)(6,8)$ and $(0,5)$. Let $E = 4x + 6y$ be the objective function . The minimum value of E occurs at** 1

A) $(0,2)$ only.

B) $(3,0)$ only.

C) the mid point of the line segment joining the points $(0,2)$ and $(3,0)$ only.

D) any point on the line segment joining the points $(0,2)$ and $(3,0)$.

CASE STUDY

A western music concert is organised every year in the stadium that can hold 36,000 spectators with a ticket price of RS. 10, the average attendance has been 24,000.Some financial expert estimated that price of the ticket should be determined by the function $p(x) = 15 - \frac{x}{3000}$ where 'x'is the number of tickets sold.

Based on the above information, answer the following questions

Q46. **The revenue R as a function of x can be represented as** 1

A) $15 - \frac{x^2}{3000}$

B) $15x - \frac{x^2}{3000}$

C) $15x - \frac{1}{30000}$

D) $15x - \frac{x}{3000}$

Q 47. **The range of x is** 1

A) $[24000,36000]$

B) $[0,24000]$

C) $[0,36000]$

D) None of these

Q48. **The number of spectators to be present to maximise the revenue is** 1

A) 22500 B) 21000 C) 20000 D) 25000

Q 49. **When revenue is maximum , the price of the ticket in Rupees is** 1

A) 5 B) 5.5 C) 7 D) 7.5

Q50. **The maximum revenue in Rupees is** 1

A) 215000 B) 156500 C) 168750 D) 225000

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