Sample Question Paper

Roll No. | | | | | | | |

Candidate must write the set number on the title page of the answer book.

D.A.V. PUBLIC SCHOOLS, ODISHA, ZONE-1
HALF YEARLY EXAMINATION (2018- 19)

- Check that there are 04 printed pages in this question paper.
- Set number given on the right hand side of the question paper should be written on the title page of the answer book by the candidate.
- Check that there are 29 questions in this question paper.
- Write down the Serial Number of the question before attempting it.
- 15 minutes coolingtime has been allotted to read this question paper. Do not write any answer on the answer book during this period.

Class- XII
MATHEMATICS

Time Allowed: 3 Hours Maximum Marks: 100

General Instructions :

i. All questions are compulsory.
ii. The question paper consists of 29 questions divided into four sections A,B,C& D. Section A comprises of 4 questions of one mark each. Section B comprises of 8 questions of 2 marks each. Section C comprises of 11 questions of 4 marks each & Section D comprises of6 questions of 6 marks each.
iii. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
iv. There is no overall choice .However,internal choice has been provided in 3 questions of four marks of Section C & 3 questions of six marks of Section D.You have to attempt only one of the alternatives in all such questions.
v. Use of calculators is not permitted.

SECTION-A

1. Differentiate Cos$^{(\log_2 x)}$ w.r.to x.
2. Find the value of x if$\cos^{-1}(x) + \sin^{-1}(3/5) = \frac{\pi}{2}$
3. Find the reflection of the point (1,2,3) in the xy - plane.

4. Write the principal value of $\cos^{-1}(\cos\frac{7\pi}{6})$

SECTION-B

5. Construct a 2x4 order matrix whose elements are given by $a_{ij} = e^{ix}$ sinjx
6. Find a vector in the direction of vector $\vec{a} = \hat{i} - 2\hat{j}$ that has magnitude 7 units.
7. Using differentials, find the approximate value of $\sqrt{49.5}$.
8. Find the area of the triangle having the points A(1,1,1) ,B(1,2,3) and C(2,3,1) as its vertices .
9. Write the equation of the plane through the points (2, 1,0), (3, -2, -2) and (3, 1, 7).
10. If A and B are two events such that $P(A)=\frac{1}{4}, P(B')=\frac{1}{3} \& P(A\cap B)=\frac{1}{8}$, then find $P(A'\cap B')$.
11. The probability of a man hitting a target is 0.25 . He shoots five times . What is the probability of his hitting the target at least twice.
12. If x = cos3 θ and y = sin 2θ find $\frac{d^2y}{dx^2}$ at $\theta=\frac{\pi}{4}$

SECTION-C

13. Solve for x , $\sin^{-1}(1-x)+\sin^{-1}x=\cos^{-1}x$

OR

Prove that 2 $\tan^{-1}\left(\frac{1}{5}\right)+sec^{-1}\left(\frac{5\sqrt{2}}{7}\right)+2\tan^{-1}\left(\frac{1}{8}\right)=\frac{\pi}{4}$.

14. Find the intervals in which the function ‘f’ given by

$f(x)=\frac{4\sin x-2x-x\cos x}{2+\cos x}$ is (i)increasing (ii) decreasing.

15. If $f(x)=\begin{cases} x^2+3x+a, x\le 1 \\ bx+2, x>1 \end{cases}$ is everywhere differentiable, then find the value of $a\wedge b$.

OR

If $y=e^{a\cos^{-1}x}$, then prove that $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}-a^2y=0$.

16. If $A=\begin{bmatrix}3 & -5\\ -4 & 2\end{bmatrix} \wedge A^2-5A-14I=0$ .Hence find A^3 .

17. Solve the equation $\sin^{-1}6x+\sin^{-1}6\sqrt{3}x=\frac{-\pi}{2}$

18. Using properties of determinants, prove the following

$$\begin{vmatrix}1+a^2-b^2 & 2ab & -2b\\ 2ab & 1-a^2+b^2 & 2a\\ 2b & -2a & 1-a^2-b^2\end{vmatrix} = (1+a^2+b^2)^3$$

OR

If a,b and c are real numbers and $\begin{vmatrix}b+c & c+a & a+b\\ c+a & a+b & b+c\\ a+b & b+c & c+a\end{vmatrix}=0$, then by

using properties of determinants show that either

$a+b+c=0 \vee a=b=c$.

19. Find the image of the line $\frac{x-1}{3}=\frac{y-3}{1}=\frac{z-4}{-5}$ in the plane 2x $-¿$ y + z + 3=0.

20. The scalar product of the vector $\hat{i}$ + $\hat{j}$ + $\hat{k}$ with a unit vector along the sum of the vectors 2 $\hat{i}$ +4 $\hat{j}$ -5 $\hat{k}$ and β $\hat{i}$ +2 $\hat{j}$ +3 $\hat{k}$ *is equal*¿ one.Find the value of β?

21. Let R be the set of real numbers and f: R→R be the function defined by f(x)=4x+5. Show that f is invertible and find f^{-1} .

22. For the curve y= 4 x^3-2x^5 , find all the points at which the tangent passes through the origin.

23. In a game, a man wins a rupee for a six and losses a rupee for any other number when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a six. Find the expected value of the

amount he wins/losses.

SECTION-D

24. Define the binary operation '*' on the set {0, 1, 2, 3, 4, 5} as

$$a*b=\begin{cases} a+b \text{ if } a+b<6 \\ a+b-6 \text{ if } a+b\geq 6 \end{cases}$$

Show that zero is the identity for this operation and each element $a\neq 0$ of the set is invertible with 6-a being the inverse of a .

OR

Show that the relation R on the set N×N defined by (a,b) R (c,d) iff ad(b+c)= bc(a+d) is an equivalence relation.

25. Using elementary row transformation ,find the inverse of the matrix,

$$A=\begin{bmatrix} 2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3 \end{bmatrix}$$

26. If lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect ,then find the value of k and also find the equation of the plane containing these lines.

OR

Find the distance of the point (2,3,4) from the plane 3x+2y+2z+5=0 measured parallel to the line $\frac{x+3}{3}=\frac{y-2}{6}=\frac{z}{2}$

27. If $(x-a)^2+(y-b)^2=c^2$, Prove that $\frac{\left(1+\left(\frac{dy}{dx}\right)^2\right)^{3/2}}{\frac{d^2y}{dx^2}}$ is a constant independent of a& b.

28. If sum of the length of the hypotenuse and a side of a right angled triangle is given,show that the area of the triangle is maximum when the angle between them is $\frac{\pi}{3}$.

OR

Show that the volume of the greatest cylinder that can be inscribed in a right circular cone of height h and semi-vertical angle α is $\frac{4}{27}\pi h^3 \tan^2 \alpha$

29. Assume that the chances of a patient having a heart attack is 40% . Assuming that a meditation and yoga course reduces the risk of heart attack by 30% and prescription of certain drug reduces its chance by 25% . At a time a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options, the selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga.

***