ANANDALAYA

PERIODIC TEST – 1

Class : XII

विद्या सवर्थि साधिका

Subject: Mathematics M.M: 40

Date : 16/07 /2019 Time: 2 Hours

General Instructions:

i) All questions are compulsory.
ii) This question paper contains 18 questions.
iii) Question 1- 8 in Section A are very short-answer type questions carrying 1 mark each.
iv) Questions 9 - 13 in Section B are short-answer type questions carrying 2 marks each.
v) Questions 14 - 17 in Section C are long-answer-I type questions carrying 4 marks each.
vi) Question 18 in Section D is long-answer-II type questions carrying 6 marks.

SECTION-A

1. Let $f: R \to R$ *and* $g: R \to R$ be two functions such that $f \; o \; g(x) = \sin x^2$ *and* $g \; o \; f(x) = sin^2 x$, then $f(x)$ *and* $g(x)$ *are* (1)

(a) $f(x) = x^2$ *and* $g(x) = \sin x$ (b) $f(x) = \sin x$ *and* $g(x) = x^2$

(c) $f(x) = sin^2 x$ *and* $g(x) = \sqrt{x}$ (d) $f(x) = \sin x$ *and* $g(x) = \sqrt{x}$

2. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, then $A + A' = I$, if the value of α is (1)

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) π (d) $\frac{3\pi}{2}$

3. For real x, let $f(x) = x^3 + 5x + 1$. then (1)

(a) f is one-one but not onto in R. (b) f is onto in R but not one – one in R.

(c) f is one - one and onto in R. (d) f is neither one – one and onto in R.

4. If k is a scalar and I is a unit matrix of order 3, then adj(kI) =……… (1)

(a) $k^3 I$ (b) $k^2 I$ (c) $-k^3 I$ (d) $-k^2 I$

5. Construct a 3 x 2 matrix A, whose elements are given by $a_{ij} = \frac{(i+2j)^2}{2}$. (1)

6. If f: R → R be defined by $f(x) = (3 - x^3)^{1/3}$, then find $f \; o \; f(x)$. (1)

OR

Let A = {1, 2, 3, …,15, 16}. Let R be the equivalence relation on A x A defined by (a, b) R (c, d) if and only if ad = bc. Find the equivalence class for [(1,3)].

7. Find the area of the triangle with vertices at the points (0,0), (6, 0), (4,3). (1)

OR

Show that the determinant $\begin{vmatrix} a & b & ap+b \\ b & c & bp+c \\ ap+b & bp+c & 0 \end{vmatrix} = 0$, if a, b, c are in G.P.

8. If the matrix $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 1 & -2 \\ 1 & 0 & 3 \end{bmatrix}$, find |adj A| without computing adj A. (1)

SECTION-B

9. If the function f: R → R be given by $f(x) = x^2 + 2$ and g: R → R be given by $g(x) = \frac{x}{x-1}$, $x \neq 1$, find f o g and g o f and hence find *(f o g) (2) and (g o f) (- 3).* (2)

10 If $A = [2 \quad 1], B = \begin{bmatrix} 1 & -2 & 0 \\ 4 & 5 & -3 \end{bmatrix}$, then verify that $B'A' = (AB)'$. (2)

OR

If the matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix, find the value of a, b, c.

11. If $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$, and x, y *and* z all are different and $\begin{vmatrix} 1 & x^2 & x^3+1 \\ y & y^2 & y^3+1 \\ z & z^2 & z^3+1 \end{vmatrix} = 0$ then show that *xyz* = – 1. (2)

12 Using properties of determinants prove that $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix} = (a-1)^3$. (2)

OR

Using Properties of determinants prove that: $\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = a^3 + b^3 + c^3 - 3abc$.

13. Prove that the diagonal elements of a skew – symmetric matrix are all zero. (2)

SECTION-C

14. Show that the relation R in the set $A = \{x : x \in W, 0 \leq x \leq 12\}$ given by $R = \{(a,b); |a-b| \text{ is a multiple of } 4\}$ is an equivalence relation. Also find the set of all elements related to 2. (4)

15. If $A = \begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$, find A^{-1} by using elementary column transformations. (4)

OR

If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ *and* $A^3 - 6A^2 + 7A + kI = O$.find k.

16. Express the following matrix as the sum of a symmetric matrix and a skew – symmetric matrix and verify your result: $\begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$ (4)

17. Consider the function $f: R^+ \rightarrow [-5, \propto)$ defined by $f(x) = 9x^2 + 6x - 5$, where R^+ is the set of all non-negative real numbers. Show that *f* is invertible and find its inverse. (4)

OR

Let $f, g: R \rightarrow R$ be two functions defined as $f(x) = |x| + x \; and \; g(x) = |x| - x$, for all x∈R, then find f o g and g o f. Hence find *(f o g) (– 2), (f o g) (4) and (g o f) (– 2)*

SECTION-D

18. Two schools P and Q want to award their selected students on the values of Discipline, Politeness and Punctuality. The school P wants to award ` x each, ` y each and ` z each for the three respective values to its 3, 2 and 1 students with a total award money of ` 1000. School Q wants to spend ` 1500 to award its 4, 1 and 3 students on the respective values. (by giving the same award money for the three values as before). If the total amount of awards for one prize on each value is ` 600, using matrices, find the award money for each value by matrix method. (6)

OR

Using properties of determinants prove that :

$$\begin{vmatrix} -bc & b^2 + bc & c^2 + bc \\ a^2 + ac & -ac & c^2 + ac \\ a^2 + ab & b^2 + ab & -ab \end{vmatrix} = (ab + bc + ca)^3.$$