INDIAN SCHOOL SOHAR
UNIT TEST 2017 – 2018
MATHEMATICS

Class: XII **Time: 2 Hrs**
Date: 21/05/17 **Marks: 50**

General Instructions

- All questions are compulsory.
- Please check that this Question Paper contains 16 Questions.
- Questions 1 to 4 in Section-A are Very Short Answer Type Questions carrying one mark each.
- Questions 5 to 8 in Section-B are Short AnswerI Type Questions carrying 2 marks each.
- Questions 9 to 13 in Section-C are Long Answer I Type Questions carrying 4 marks each
- Questions 14 to 16 in Section-C are Long Answer II Type Questions carrying 6 marks each
- Please write down the serial number of the Question before attempting it.
- 10 minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

SECTION A

1. Let R be the equivalence relation in the set Z of integers given by R={(a, b): 2 divides a – b}. Write the equivalence class [0]
2. Find the value of $\sin^{-1}\left(\sin\frac{33\pi}{7}\right)+\cos^{-1}\left(\cos\frac{46\pi}{7}\right)$
3. If a line makes angles a, b, c with the co ordinate axes, what is the value of cos2a + cos2b +cos2c ?
4. If $\vec{a}$ is a unit vector and $\left(2\vec{x}-3\vec{a}\right)\cdot\left(2\vec{x}+3\vec{a}\right)$ = 91 , find the value of x.

SECTION B

5. If $\tan^{-1}x+\tan^{-1}\frac{1}{2}=\frac{\pi}{4}$, where x is acute, find the value of x .
6. If $\vec{a}$ and $\vec{b}$ are the unit vectors such that $\vec{a}+2\vec{b}$ and $5\vec{a}-4\vec{b}$ are perpendicular to each other ,then find the angle between $\vec{a}$ and $\vec{b}$.
7. A man rides his motorcycle at the speed of 50 km/hour. He has to spend Rs 2 per km on petrol. If he rides it at a faster speed of 80 km/hour, the petrol cost increases to Rs 3 per km. He has atmost Rs 120 to spend on petrol and one hour's time. He wishes to find the maximum distance that he can travel. Express this problem as a linear programming problem.
8. Find the vector equation of the line passing through the point (2 , -1 , 1) and parallel to the line joining the points (-1 , 4 ,1) and (1, 2, 2) .

SECTION C

9. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$ prove that $x^4 + y^4 + z^4 + 4x^2y^2z^2 = 2[x^2y^2 + y^2x^2 + z^2x^2]$

10. Minimise Z = 3x + 5y subject to the constraints: $x + 2y \geq 10$, $x + y \geq 6$, $3x + y \geq 8$, x , $y \geq 0$

11. Find the equation of the plane through the line of intersection of the planes x + y + z = 1 and 2x + 3y + 4z = 5 which is perpendicular to the plane x – y + z = 0.

    [OR]

    Find the equation of the plane through the intersection of the planes 3x – y + 2z – 4 = 0 and x + y + z – 2 = 0 and the point (2, 2, 1).

12. Let a function $f; R \to R$ be defined by f(x) = 1 + α x , $\alpha \neq 0$,for all $x \in R$ .Show that f is invertible and find its inverse function .Also find the value(s) of α if inverse of f is f itself .

    [OR]

    Define a binary operation $*$ on the set {0, 1, 2, 3, 4, 5, 6} as a * b = $\begin{cases} a+b \text{ if } a+b<7 \\ a+b-7 \text{ if } a+b \geq 7 \end{cases}$

    Show that zero is the identity for this operation and each element a of the set is Invertible with 7 – a being the inverse of a.

13. Find the value of λ if the points A (-1 , 4 , -3), B = (3 , λ ,- 5) , C (-3 , 8 ,-5) and D (-3 , 2 , 1) are co planar

SECTION D

14. Find the equation of the line passing through the point (4, 6, 2) and the point of intersection of the line $\frac{x-1}{3} = \frac{y}{2} = \frac{z+1}{7}$ and the plane x + y – z = 8

    [OR]

    Show that the lines $\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$: $\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$ are co planar .Find their common point and the equation of the plane in which they lie.

15. Let A = N X N and let be a binary operation on A defined by (a , b)* (c , d) = (ad + bc , bd) , for all (a, b) , (c , d) $\in$ N X N . Show that
    (i) '* ' is commutative on A (ii) ' *' is associative on A (iii) A has no identity element.

16. Solve the following equation for 'x' $\tan^{-1}\frac{1}{2x+1} + \tan^{-1}\frac{1}{4x+1} = \tan^{-1}\frac{2}{x^2}$

    [OR]

    Solve the equation $\cos^{-1}\left(\sqrt{6}\,x\right) + \cos^{-1}\left(3\sqrt{3}\,x^2\right) = \frac{\pi}{2}$