B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2025
SEMESTER 5 : MATHEMATICS
COURSE : **19U5CRMAT08 : HUMAN RIGHTS AND MATHEMATICS FOR ENVIRONMENTAL STUDIES**
(For Regular 2023 Admission and Supplementary 2022/ 2021/ 2020/ 2019 Admissions)

Time : Three Hours

Max. Marks: 75

PART A
Answer any 10 (2 marks each)

1. Which are the laws intended to prevent air pollution?
2. What do you mean by dams?
3. Mention the various names under which Golden ratio is known.
4. Define topological index.
5. $\lim\limits_{n \to \infty} \frac{F_n}{F_{n+1}} = \ldots$
6. How are the human rights of women violated?
7. What are the Fibonacci and Lucas squares and cubes?
8. Expand JFM and exlpain.
9. Welfare of Women comes under which organisation of the UN? State two other functions of the organisation.
10. How can marine pollution be controlled?
11. Does Pineapples show any Fibonacci pattern? Justify.
12. What is the necessary and sufficient condition for a bilinear transformation to have 2 distinct fixed points?

(2 x 10 = 20)

PART B
Answer any 5 (5 marks each)

13. Find the number of subsets including the null set of a set of n points such that consecutive points are not allowed if the points lie on a line.
14. Write a note on Women and Human Rights.
15. Explain the role of an individual in conservation of natural resources.
16. Compute the sum $\sum_1^n {F_i}^2$ and $\sum_1^n {L_i}^2$ for $n = 5$.
17. Explain in detail how the pattern of Fibonacci and Lucas numbers can be observed from atoms.
18. Given that A and C on the axes are each one unit away from the origin. The point B lies one unit away from both axes in the first quadrant. Find the value of x such that the y-axis bisects the area $ABCD$ where D is the point $(-x, -x)$ and $x > 0$.
19. Noise pollution can affect human health adversely. Elaborate.
20. Given two circles A and B (one inside the other but tangential at a point O) of radii a and b and centroids C_A and C_B respectively, such that the points O, C_A and C_B are collinear and also that the endpoint C of the diameter of B through O and C_B is the centroid of the remnant, show that the ratio of radii of A and B is the golden ratio.

(5 x 5 = 25)

PART C
Answer any 3 (10 marks each)

21. (a) What do you mean by Ozone layer depletion, Green house effect and global warming?
    (b) What is acid rain? What are the causes and effects of acid rain? Explain

22. a) State and prove the relation connecting Fibonacci numbers and compositions of a positive integer expressed as sums of 1's and 2's.
    b) Prove that $f(n) = g(n+1)$ where $n \geq 1$, if $f(n)$ denotes the total number of 1's and $g(n)$ denotes the total number of 2's in the various compositions of a positive integer n.

23. Explain the relationship golden ratio has to centroids of circles.

24. Elaborate on (a) Geothermal energy (b) Nuclear power.

(10 x 3 = 30)