Name ....

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

Time : Three Hours   Max. Marks: 75

PART A
Answer any 10 (2 marks each)

1. What led Gattei to find a solution that involves the golden ratio?
2. What do you mean by dams?
3. How are plants affected by air pollution?
4. What is incineration? How is it useful?
5. Can Fibonacci numbers take the form $\omega^3 \pm 1$? Justify with example.
6. $\lim\limits_{n\to\infty} \dfrac{F_n}{F_{n+1}} = \ldots$
7. What is ICCPR? What is its function?
8. What are the drawbacks of coal based power generation?
9. If $\tan\theta = \dfrac{1}{\sqrt{\alpha}}$, show that $\sec\theta = \sqrt{\alpha}$ where α is the golden ratio.
10. Write the recursive definition for Fibonacci numbers and Lucas numbers.
11. Who all comprises the SHRC?
12. 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, what is the value of f and g when n=4?

(2 x 10 = 20)

PART B
Answer any 5 (5 marks each)

13. What are the major causes of land degradation? Explain.
14. Given a bilinear transformation $\omega = \dfrac{az+b}{cz+d}$, if we have $a - d = b = c \neq 0$, prove that the bilinear transformation has two distinct fixed points α and β, where a,b,c and d are integers; $a, d > 0$ and $ad - bc = 1$.
15. Discuss the Euler construction of golden ratio.
16. Write a note on Fibonacci, pinecones, artichokes and pineapple.
17. Where did the pattern of Fibonacci numbers appear first? Explain.
18. Explain the objectives and functions of the International Labour Organization.
19. Draw the tables depicting the topological indices of paraffins and cycloparaffins ad write the observation.
20. What is soil pollution? What are the different aspects of soil pollution?

(5 x 5 = 25)

PART C
Answer any 3 (10 marks each)

21. What are the causes, effects and control measures of water pollution?

22. a) Prove that the number of distinct compositions of a positive integer n in terms of 1's and 2's is F_{n+1}.

    b)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, prove that

    (a) $f(n) = f(n-1) + f(n-2) + F_n$
    (b) $g(n) = g(n-1) + g(n-2) + F_{n-1}$.

23. (a) Write an note on Golden ratio and origami.

    (b) Consider an equilateral traingle ABC inscribed in a circle. Let Q and R be the mid points of the sides AB and BC and let QR meet the circle at P.and S such that $PQ = RS = 1$ and $QR = x$. Find x.

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

(10 x 3 = 30)