19U501 (Pages: 2) Name: ……..……….……..

Reg. No: ………………….

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2021

(CBCSS-UG)

CC19U MTS5 B05 - THEORY OF EQUATIONS AND ABSTRACT ALGEBRA

(Mathematics – Core Course)

(2019 Admission - Regular)

Time: 2 ½ Hours   Maximum: 80 Marks

Credit: 4

Section A

Answer *all* questions. Each question carries 2 marks.

1. What is the quotient obtained when $x^5 - 3x^2 + 6x - 1$ is divided by $x^2 + x + 1$?

2. What is the remainder obtained when $x^6 - x^5 + 5x + 3$ is divided by $x-3$?

3. Write the Tylor's Formula for writing an nth degree Polynomial $f(x)$ in powers of $(x-c)$

4. Write a cubic equation with roots 0, 1, 2

5. Find the sum and product of roots of $x^3 + 2x^2 + 3x + 2 = 0$.

6. Find the multiplicative inverse of 7 in Z_{15}

7. Write the addition table of Z_6

8. Find the number of generators of Z_{20}

9. Define a group. Give an example.

10. Check whether the following permutation is even or odd $(1,4,6,3)(2,3,5)$

11. Find the order of the permutation $(1,2,5,3)(3,4,5)$.

12. Define Zero divisors in a ring. Which are the zero divisors in Z_6.

13. In $GL_2(R)$, find the order of $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$.

14. Let $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 4 & 1 & 2 & 5 \end{pmatrix}$, $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 4 & 2 & 5 & 3 \end{pmatrix}$, compute $\sigma\tau$.

15. Check whether the relation on R , defined by a~b if $a \geq b$ is an equivalence relation

(Ceiling: 25 marks)

Section B

Answer *all* questions. Each question carries 5 marks.

16. Solve $x^4 - 2x^3 + 6x^2 + 22x + 13 = 0$ having the root $2+3i$

17. Factorize into linear or quadratic factors $x^6 - 1$.

18. Solve $3x^3 - 16x^2 + 23x - 6 = 0$, if the product of two roots is 1.

19. Find an upper limit of positive roots of $2x^5 - 7x^4 - 5x^3 + 6x^2 + 3x - 10 = 0$.

20. Prove that the set of all even permutations in S_n is a group.

21. Draw the subgroup diagram of Z_{18}.

22. Let S=R-{-1}, define $*$ on S by $a*b=a+b+ab$ .Show that $(S,*)$ is a group.

23. Show that the set of all units of Z_n is a group.

(Ceiling: 35 Marks)

Section C

Answer any *two* questions. Each question carries 10 marks.

24. Find the Integral roots of $x^6+3x^5-36x^4-45x^3+93x^2+132x+140=0$.

25. Solve the cubic $3x^3-6x^2-2=0$.

26. Show that a sub group of a cyclic group is cyclic.

27. Show that set of all permutations on a set A is a group under permutation multiplication.

(2 × 10 = 20 Marks)

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