U.S.N

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Seventh Semester, B.E. - Semester End Examination; Jan. / Feb. - 2021

Graph Theory, Number Theory and Analysis

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

Q.No.		Question	Marks
1	a.	Define Absolute, Relative and Percentage errors with examples.	6
	b.	Find a real root of the equation $x^3 - 2x - 5 = 0$, using secant method.	7
	c.	Use Birge-Vieta method, to find a real root of the equation $x^5 - x + 1 = 0$, $p = -1.5$ correct to three decimal places.	7
2	a.	Use secant method, to find real root of the equation, $x^4 - x - 10 = 0$.	6
	b.	Find a quadratic factor of the polynomial $x^3 - x - 1 = 0$ using Bairstow's method.	7
	c.	Using Graeffe's method, find a real root of the equation $x^3 - 6x^2 + 11x - 6 = 0$.	7

UNIT - II

Q.No.		Question	Marks
3	a.	i) Define Greatest Common Divisor. ii) If 'a' is any integer and $b \neq 0$, then there exists unique integers q and r such that $a = bq + r$ where $0 \leq r < b$.	10
	b.	i) Find the gcd(12378, 3054). ii) Let a, b, c are integers with a and b not both zeros. Let $d = gcd(a, b)$ then the equation $ax + by = c$, has an integer solution x, y iff c is a multiple of d in which case there are infinitely many solutions. There are the pairs $x = x_0 + \frac{nb}{a}, y = y_0 - \frac{na}{b}, n \in Z$ where x_0, y_0 is any particular solution.	10
4	a.	i) Define relatively prime. ii) Solve Diophantine equation $1492x + 1066y = -4$.	10
	b.	i) State and prove fundamental theorem of arithmetic. ii) Let P_n be n^{th} prime, prove that $P_n \leq 2^{2^{n-1}}$ for all $n \geq 1$.	10

UNIT - III

Q.No.		Question	Marks
5	a.	i) Define congruence. For $n > 1$ and for any arbitrary integers a, b, c, d prove that (a) if $a \equiv b \pmod{n}$ and $c \equiv d \pmod{n}$ then $a + c \equiv b + d \pmod{n}$. ii) If $a \equiv b \pmod{n}$ then $a^k \equiv b^k \pmod{n}$	6
	b.	If $ca \equiv cb \pmod{n}$ then prove that $a \equiv b \pmod{n/d}$ where $d = gcd(a, b)$.	7
	c.	State and prove Lagrange's theorem for polynomial.	7

Contd…2

6 a. Solve simultaneous non linear congruence's; 6

$x^2 \equiv 1 \pmod{3}, \ x \equiv 2 \pmod{4}$

b. What is the remainder when $3^{12} + 5^{12}$ is divided 13? 7

c. State and prove Chinese remainder theorem. 7

UNIT - IV

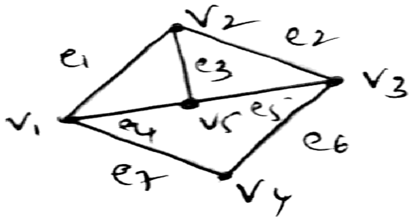
7 a. i) Define Walk, Path and Trial in a graph G with examples. 10

ii) Define locating number and determine the locating number of a wheel W_5.

b. i) Define incidence matrix of a graph.

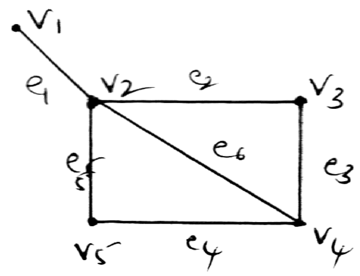
ii) Determine number of edge sequences of length 2 between; 10

I) v_1 and v_5 II) v_4 and v_2



8 a. i) Define circuit matrix of a graph. 10

ii) Verify $I(G). B(G)^T = 0$ for the following graph:



b. Use circuit matrix to determine how switches are connected in a black box, given the possible combinations: *(a, b, f, h, k), (a, b, g, k), (a, e, f, g, k), (a, e, h, k), (b, c, e, h, k), (c, f, h, k), (c, g, k), (d, k).* 10

UNIT - V

9 a. i) Define chromatic polynomial of a graph. 10

ii) Determine the chromatic number of, I) $K_{1,n}$ II) C_n

b. Use graph coloring to schedule a time table for four teachers and four slots 10

	N_1	N_2	N_3	N_4
T_1	2	0	1	1
T_2	0	1	0	1
T_3	0	1	1	1
T_4	1	0	1	0

10 a. Explain the application of graph coloring in GSM networks. 10

b. Construct contact network graph for the given single contact function. 10

$$F_{ab} = x_1x_2x_3x_5x_7 + x_1x_3x_4x_6 + x_1x_5x_6x_8 + x_2x_4 + x_2x_3x_5x_8 + x_5x_6x_7$$

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