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Code No. : 12035 (B)

## VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD B.E. (C.S.E. : CBCS) II-Semester Main Examinations, January-2021 Discrete Structures

Time: 2 hours

Max. Marks: 60

Note: Answer any NINE questions from Part-A and any THREE from Part-B

Part-A (	9 ×	2=	18	Marks)
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Q. No.	Stem of the question	M	L	СО	PO
1.	Translate "You cannot ride the roller coaster if you are under 4 feet tall unless you are older than 16 years old" into a logical expression.	2	1	1	1,12
2.	R: Naveen is rich	2	1	1	1,12
	H: Naveen is happy are two statements. Convert the following statements in symbolic form				
	"Naveen is neither rich nor happy".				
3.	Find the gcd(1529, 14039).	2	1	2	1,12
4.	State the fundamental theorem of arithmetic.	2	1	2	1,12
5.	Define partial order relation.	2	1	3	1,12
6.	How many arrangements are there with the letters of the word MISSISSIPPI.	2	2	3	1,12
7.	Write the characteristic equation of $a_n = a_{n-1} + 6a_{n-2}$ .	2	3	4	1,12
8.	Write the general form of the homogeneous linear recurrence relation.	2	1	4	1,12
9.	Define subgroup of a group.	2	1	5	1,12
10.	Find the identity element of the Ring $(Z, \bigoplus, \odot)$ where	2	3	5	1,12
	$x \oplus y = x + y - 7$ and $x \odot y = x + y - 3xy$ for all $x, y \in Z$ .				
11.	Write the negation of the statement	2	2	1	1,12
	Real number x, if $x > 3$ then $x^2 > 9$				
12.	If a b then prove that a bc for all a,b,c $\in Z$ .	2	2	2	1,12
	Part-B (3 × 14 = 42 Marks)				
13. a)	Determine whether $[\sim q \land (p \rightarrow q)] \rightarrow \sim p$ is a Tautology.	7	3	1	1,12
b)	State and prove generalized pigeon-hole principle.	7	2	1	1,12

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b) Use generating functions to solve the recurrence relations $a_r = 7$ 3 4 1,12 $a_{r-1} + a_{r-2}$ with $a_1 = 2$ and $a_2 = 3$ 17. a) Show that (A,*) is a non-abelian group where A= R x R and (a,b) * (c,d) = (ac, bc+d). b) If (F, +, .) is a field then prove that it is an Integral Domain. 18. a) Show that $\sim (p \lor (\sim p \land q) \text{ and} (\sim p \land \sim q) \text{ are logically Equivalent.}$ b) State and prove Fermat's Little theorem. 19. Answer any <i>two</i> of the following: a) Show that congruence modulo m is an equivalence relation on integers. b) Find all solutions of the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 7$ 4 4 1,12							
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$R = \{(x, y)/x - y \text{ is divisible by 3}\} in X.$ Show that $R$ is an equivalence relation. b) How many positive integers not exceeding 1000 are divisible by 7 or 17 3 3 1,12 11? 16. a) Solve the recurrence relation $a_n - a_{n-1} - 12a_{n-2} = 0$ , $a_0 = 0, a_1 = 1$ 7 4 4 1,12 b) Use generating functions to solve the recurrence relations $a_r = 7$ 3 4 1,12 $a_{r-1} + a_{r-2}$ with $a_1 = 2$ and $a_2 = 3$ 17. a) Show that $(A,*)$ is a non-abelian group where $A = R \ge R$ and (a,b) * $(c,d) = (ac, bc+d)$ . b) If $(F, +, .)$ is a field then prove that it is an Integral Domain. c) If $(F, +, .)$ is a field then prove that it is an Integral Domain. c) State and prove Fermat's Little theorem. c) State and prove Fermat's Little theorem. c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub- c) If H is a non-empty sub-group of a group G then prove that H is a sub-		b)		7	4	2	1,12
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11?16. a)Solve the recurrence relation $a_n - a_{n-1} - 12a_{n-2} = 0$ , $a_0 = 0, a_1 = 1$ 74411?b)Use generating functions to solve the recurrence relations $a_r = 7$ 34 $a_{r-1} + a_{r-2}$ with $a_1 = 2$ and $a_2 = 3$ 17. a)Show that $(A,*)$ is a non-abelian group where A= R x R and(a,b)*(c,d) = (ac, bc+d).b)If (F, +, .) is a field then prove that it is an Integral Domain.72518. a)Show that $\sim (p \lor (\sim p \land q) \text{ and} (\sim p \land \sim q) \text{ are logically Equivalent.}$ 7219.Answer any <i>two</i> of the following:a)a)Show that congruence modulo m is an equivalence relation on integers.b)Find all solutions of the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 7$ 444725112113.114.115.115.115.116.116.117.118.119.119.119.119.119.119.1111.1111.1111.1111.1111.1111.1111.1111.1111.1111.1111.1111.1111.1111.1111.<							ink
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<ul> <li>b) If (F, +, .) is a field then prove that it is an Integral Domain.</li> <li>18. a) Show that ~(p ∨ (~ p ∧ q) and (~ p ∧~ q) are logically Equivalent.</li> <li>7 5 1 1,12</li> <li>b) State and prove Fermat's Little theorem.</li> <li>7 2 2 1,12</li> <li>19. Answer any <i>two</i> of the following:</li> <li>a) Show that congruence modulo m is an equivalence relation on integers.</li> <li>b) Find all solutions of the recurrence relation a<sub>n</sub> - 7a<sub>n-1</sub> + 10a<sub>n-2</sub> = 7 4 4 1,12</li> <li>c) If H is a non-empty sub-group of a group G then prove that H is a sub-</li> <li>7 2 5 1,12</li> </ul>	17.	a)	Show that $(A,*)$ is a non-abelian group where $A = R \times R$ and	7	4	5	1,12
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<ul> <li>4<sup>n</sup></li> <li>c) If H is a non-empty sub-group of a group G then prove that H is a sub-</li> <li>7 2 5 1,12</li> </ul>		a)		7	3	3	1,12
		b)		7	4	4	1,12
		c)		7	2	5	1,12
b) for all $a \in H$ , $a^{-1} \in H$ .		-	b) for all $a \in H$ , $a^{-1} \in H$ .				

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PC

O: Programme	Outcome
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S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	38
2	Knowledge on application and analysis (Level-3 & 4)	62
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	0

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