Hall Ticket Number:

Code No. : 13663 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. III-Semester Main & Backlog Examinations, Jan./Feb.-2024

Discrete Mathematics

(I.T.)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Explain Bi-implication with an example.	2	1	1	1,2,12
2.	Distinguish among contradiction and contingency.	2	1	1	1,2,12
3.	Prove that if $2^p - 1$ is prime then 'p' is also prime.	2	1	2	1,2,12
4.	Find the total number of positive divisors $\tau(n)$ and sum of the positive divisors $\sigma(n)$ for the number $n = 14553$.	2	2	2	1,2,12
5.	Explain Generalized Pigeonhole principle with an example.	2	1	3	1,2,12
6.	Solve the recurrence relation$a_n - 3a_{n-1} = 5 . 7^n$for $n \geq 1$ given that $a_0 = 2$.	2	2	3	1,2,12
7.	If A={1,2,3,4} then write an example of a relation on A which is (i)Reflexive, Symmetric but not Transitive. (ii) Symmetric, Transitive but not reflexive.	2	1	4	1,2,12
8.	Explain the procedure for constructing Hasse diagram.	2	1	4	1,2,12
9.	If G=(V,E) is a simple graph then Prove that $2\|E\| \leq \|V\|^2 - \|V\|$.	2	2	5	1,2,12
10.	Define planar graph with an example and Verify the Euler's formula for planar graphs with that example.	2	1	5	1,2,12
	Part-B (5 × 8 = 40 Marks)				
11. a)	Verify whether $(p \rightarrow q) \rightarrow r$ and $p \rightarrow (q \rightarrow r)$ are equivalent.	4	3	1	1,2,12
b)	Use quantifiers to express the following: a) Every computer science student needs a course in discrete mathematics. b) There is a student in this class who owns a personal computer. c) Every student in this class has taken atleast one computer science course. d) Every student in this class has been in atleast one room of every building on campus.	4	1	1	1,2,12
12. a)	Prove that (i) The Sum of even integer and odd integer is odd. (ii) Prove that the square of any odd integer is of the form 8k+1, for some integer 'k'.	4	2	2	1,2,12

Contd... 2

260

		M	L	CO	PO
b)	Apply solution criteria to solve the Linear congruence $6x \equiv 15 \pmod 9$.	4	3	2	1,2,12
13. a)	Find the no. of Permutations of the letters of the word "MISSISSIPPI". How many of these begin with 'I' ? Also how many of these begin with 'S' and end with 'S'.	4	2	3	1,2,12
b)	Solve the recurrence relation of the Fibonacci series of numbers.	4	3	3	1,2,12
14. a)	Prove that congruence relation is a Equivalence relation.	4	2	4	1,2,12
b)	Let A= {1,2,3,4,6,8,12} ,define a relation 'R' on A such that $x\,R\,y$ iff x $divides$ y , then (i)Prove that (A,R) is a Poset (ii) Draw the Hasse diagram of R (iii) Find the Maximal, Minimal, Greatest & Least elements if any.	4	3	4	1,2,12
15. a)	Define (i) Simple Graph (ii) Complete Graph (iii) Bipartite Graph (iv) Complete Bipartite Graph with one example each.	4	1	5	1,2,12
b)	Let G=(V,E) be a simple graph of order 'n' and size 'm'. If G is bipartite graph then prove that $4m \le n^2$.	4	2	5	1,2,12
16. a)	Prove that the generalization of Demorgan's law $\overline{\cap_{i=1}^{n} A_i} = \cup_{i=1}^{n} \overline{A_i}$, $\forall$ positive integer $n > 1$, using Mathematical Induction.	4	3	1	1,2,12
b)	Define Euler's φ – function and also find the number of positive integers which are less than 25200 that are relatively prime to 25200.	4	2	2	1,2,12
17.	Answer any *two* of the following:				
a)	State and Prove Pascal's Identity.	4	2	3	1,2,12
b)	Let A={1,2,3,4}, B={w,x,y,z} and C={5,6,7}. Also let R_1 be a relation from A to B ; R_2 and R_3 be the relations from B to C defined by R_1={ (1,x) (2,x) (3,y) (3,z) } ; R_2={ (w,5) (x,6) } ; R_3= { (w,5) (w,6) } then find (i) $R_1 o R_2$ and $R_1 o R_3$ (ii) M(R_1) , M(R_2) & M(R_1o R_2) (iii) Verify that M(R_1o R_2)= M(R_1).M(R_2) .	4	3	4	1,2,12
c)	In every graph Show that the number of vertices of odd degree is even.	4	2	5	1,2,12

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

i)	Blooms Taxonomy Level – 1	27.50%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	32.5%

*****