Reg No:..... Name..... 25U2054

BA, B SC, B COM DEGREE END SEMESTER EXAMINATION - APRIL 2025
UGP(HONS.) SEMESTER - 1: DISCIPLINE SPECIFIC COURSE
COURSE: 24UMATDSC112: DISCRETE MATHEMATICS

Duration – 2 hours Max Marks – 70

PART-A

(Each question carries 2 marks. A maximum of 10 marks can be scored from this part.)

1	a) Calculate the number of arrangements of the word MISSISSIPPI. b) Compute the number of ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls.	A, CO1
2	A bag contains six white marbles and five red marbles. Compute the number of ways four marbles can be drawn from the bag if a) two must be red and two must be white. b) they must all be of same colour.	A, CO1
3	Find the $g \circ f$, if $f: \boldsymbol{N} \to \boldsymbol{N}$ defined by $f(x) = 2x$ and $g: \boldsymbol{N} \to \boldsymbol{N}$ defined by $g(x) = x^2$.	U, CO2
4	a) Discuss the function $f: \boldsymbol{R} \to \boldsymbol{R}$ defined by $f(x) = 4x^4$ is bijective or not. b) Find $\sum_{i=1}^{3} \sum_{j=1}^{4} ij$.	U, CO2
5	a) Explain path and trail of a graph with an example. b) Give an example for a bipartite graph.	A, CO3
6	Obtain the graph if the adjacency matrix is $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 0 \\ 2 & 0 & 0 \end{bmatrix}$. Hence determine the incidence matrix.	A, CO3
7	Explain planar graph with an example, then find the number of regions in your planar graph using the Euler's formula.	A, CO4
8	Draw the spanning trees of a) $K_{1,6}$. b) K_4.	A, CO4

PART-B

(Each question carries 5 marks. A maximum of 30 marks can be scored from this part.)

9	Calculate the number of ways can a number greater than one million can be formed without repetition with the digits 4,6,6,0,3,6,3.	A, CO1
10	Compute the bit strings of length eight either start with a 1 bit or end with the two bits 00?	A, CO1
11	Define the greatest integer function and draw the graph of the function.	U, CO2
12	For any sets A,B and C, show that $(A - B) - C = (A - C) - (B - C)$.	U, CO2
13	Explain the following in a rooted tree G. a) parent b) children c) siblings d) leaf e) ancestors	A, CO3
14	Illustrate between depth first search and breadth first search with an example.	A, CO3
15	Suppose that a connected planar graph has 6 vertices, each of degree 4. Compute the number of regions is the plane divided by a planar representation of this graph.	A, CO4

16 Write a short note on Travelling salesman problem. A, CO4

PART-C

(Each question carries 15 marks. A maximum of 30 marks can be scored from this part.)

17 Calculate the number of arrangements of the letters of the word BOOKKEEPER. A, CO1

Compute the number of these arrangements,

a) do the words start with B.

b) do all the vowels always occur together.

c) do the vowels never occur together.

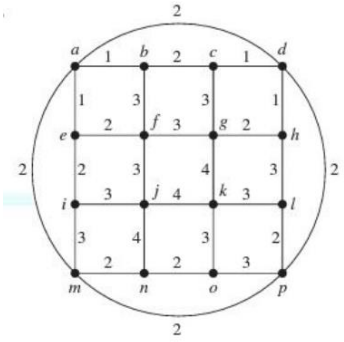
d) do the words begin with R and end in P.

18 U, CO2

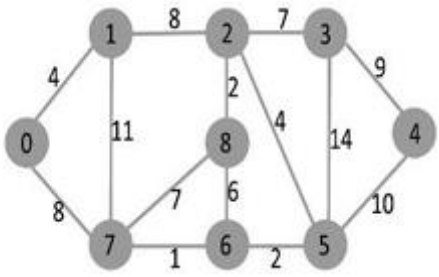
a) If a and r are real numbers and $r \neq 0$, then show that $\sum_{j=0}^{N} ar^j = \begin{cases} \frac{ar^{n+1}-a}{r-1}, if\ r \neq 1 \\ (n+1)a, if\ r = 1 \end{cases}$.

b) Show that $g \circ f$ is one to one and onto if $f: X \to Y, g: Y \to Z$ are both one to one and onto.

19 Illustrate Prim's algorithm and Kruskal's algorithm, hence find the minimum spanning trees of the graph G using these algorithms. A, CO3



20 Explain Dijkstra's algorithm to find the shortest path. Also apply it on the following graph by taking the vertex '0' as source. A, CO4



OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Marks
CO1	Apply the basic concepts in combinatorial graph theory in science, business and industry.	A	1,2,9,10,17	29
CO2	Understand fundamental concepts in set theory, including set operations and functions.	U	3,4,11,12,18	29
CO3	Apply graph theoretical algorithms to solve problems in daily life.	A	5,6,13,14,19	29

CO4	Understand Euler's theorem to planar graphs and apply Dijkstra's algorithm to find the shortest path in weighted graphs.	A	7,8,15,16,20	29

Cognitive Level (CL): A – Apply , An –Analyze , U –Understand , Cr – Create , R –Remember