

**End Semester Examination (February 2022)****Academic Year: 2021-2022**

Max. Marks: 50

Class: S.Y.Btech

Course: Discrete Structures

Program: Computer Engineering

Duration: 2 Hrs.

Semester: III

Course Code:DJ19CEC303

Instructions:

- (1) Solve ANY FIVE questions.
- (2) Read the questions carefully.
- (3) Assume suitable data wherever required, but justify it.
- (4) All questions carry equal marks.
- (5) Answer to each new question is to be started on a fresh page.
- (6) Figure to the right indicate full marks.
- (7) Draw the neat labelled diagrams wherever necessary.

Q. No.	Question	Max. Marks
Q1	(a) 100 sportsmen were asked whether they play cricket, football or hockey. Out of these 45 play cricket, 21 play football, 38 play hockey, 18 play cricket and hockey, 9 play cricket and football, 4 play football and hockey and 23 play none of these. Find the number of sportsmen who play exactly one of the game.	5
	(b) Let p and q be the propositions "Swimming at the New Jersey shore is allowed" and "Sharks have been spotted near the shore" respectively. Express each of these compound propositions as an English sentence. i) $\neg p \vee q$ ii) $p \rightarrow \neg q$ iii) $\neg q \rightarrow p$ iv) $\neg p \rightarrow \neg q$ v) $p \leftrightarrow \neg q$	5
Q2	Let $R = \{(1, 4), (2, 1), (2, 5), (2, 4), (4, 3), (5, 3), (3, 2)\}$ on the set $A = \{1, 2, 3, 4, 5\}$. Use Warshall's algorithm to find transitive closure of R.	10
Q3	(a) Prove by mathematical induction $5^n - 4n - 1$ is exactly divisible by 16 for $n \geq 1$	5
	(b) A box contains 4 white, 6 black and 5 red balls. Two balls are selected by a person. Find probability that – a) Both are of same colour b) Both are not red.	5



Q4	(a)	<p>Give the stepwise construction of minimum cost spanning tree using Prim's algorithm for following graph and find minimum cost.</p>	6
	(b)	<p>Determine which of the following graphs represents Eulerian circuit, Eulerian path, Hamiltonian circuit, and Hamiltonian path.</p>	4
Q5	(a)	<p>Solve the following recurrence relation using Homogeneous solution. $a_r + 6a_{r-1} + 12a_{r-2} + 8a_{r-3} = 0$</p>	5
	(b)	<p>Determine the generating function of $a_r = 3^r + 4^{r+1}$ where $r \geq 0$</p>	5
Q6	(a)	<p>Consider $f(x) = x^3 + 1$ and $g(x) = \sqrt[3]{(x-1)}$ defined on $f, g : \mathbb{R} \rightarrow \mathbb{R}$. Show that $(g \circ f)(1) = 1$, $(g \circ f)(2) = 2$, $(g \circ f)(3) = 3$, and $(g \circ f)(x) = x$</p>	4
	(b)	<p>Let $A = \{1, 2, 3, 4, 6, 9, 12\}$ and $R = \{(a, b) : a, b \in A, b \text{ is exactly divisible by } a\}$ Show that R is POSET. Draw Hasse Diagram.</p>	6

All the Best!