Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

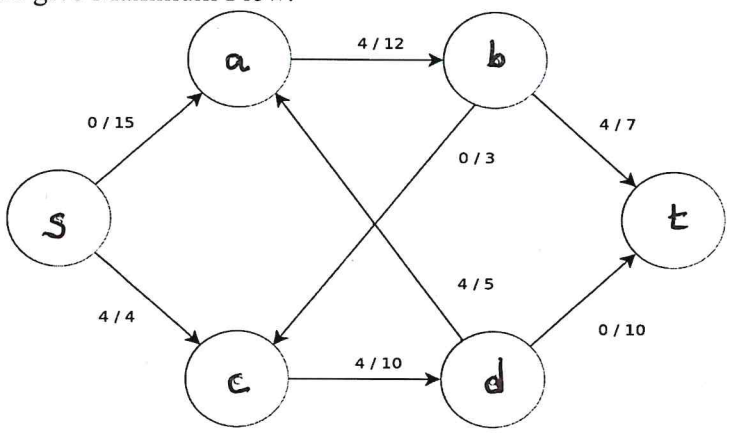
Academic Year (2021-22)
Year: 3 Semester: VI

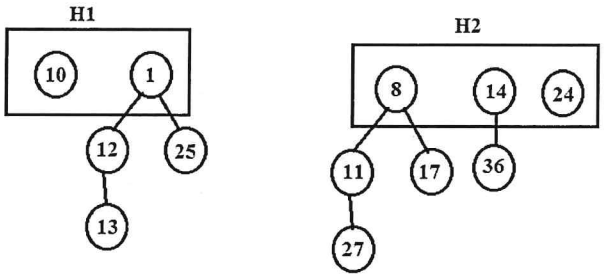
Program: B. Tech. (Computer Engineering) **Max. Marks: 75**
Subject: Advance Algorithm **Time: 10:30 am to 1:30 pm**
Date: 28/06/2022 **Duration: 3 Hours**

REGULAR EXAMINATION

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

(1) This question paper contains **02** pages.
(2) All Questions Are Compulsory.
(3) All questions carry equal marks.
(4) Answer to each new question is to be started on a fresh page.
(5) Figures in the brackets on the right indicate full marks.
(6) Assume suitable data wherever required, but justify it.
(7) Draw the neat-labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	What is the difference between Randomized BST and Treap? Construct the Treap for following elements: (10 , 6), (20 , 5), (30 , 4), (40 , 3), (50 , 2), (60 , 1) Is above constructed Treap is "Skewed Data Structure"? Comment on the Probability of "Skewed Treap".	[05]
Q1 (b)	Apply Push-Relabel algorithm on following Flow Network. Draw the resultant network and give Maximum Flow. 	[10]
Q2 (a)	Construct the Balanced KD Tree for following elements where K=2 (6 , 2), (7 , 1), (2 , 9), (3 , 6), (4 , 8), (8 , 4), (5 , 3), (1 , 5), (9 , 5) **OR** Construct the RB Tree for successive insertion of following elements: (9), (5), (98), (-5), (6), (4), (15), (3), (23) Define and mention the Black Depth of constructed RB Tree. (Note: Write 'R' for Red node and 'B' for Black node while constructing the RB Tree)	[10] [10] **P.T.O**

Q2 (b)	List all the properties of Binomial Heap. Find the mistake in following Binomial Heaps, Correct the mistake and perform MELD operation on H1 and H2. 	[05]
Q3 (a)	Give complexity analysis of Randomized Quick Sort in detail. **OR** Demonstrate Maximum bipartite matching using Ford-Fulkerson method for following input adjacency matrix. **0 1 1 0 0 0** **1 0 0 1 0 0** **0 0 1 0 0 0** **0 0 1 1 0 0** **0 0 0 0 0 0** **0 0 0 0 0 1**	[05] [05]
Q3 (b)	Discuss All the Line Segment properties in detail with suitable example. **OR** Define Convex Hull and explain Graham Scan algorithm with suitable example. Example should have Minimum 8 points, forming a Convex Hull of 4 points. (Note: Draw Convex Hull and show the clear stack state after each step of Graham Scan Algorithm. Draw the Final Convex Hull)	[10] [10]
Q4 (a)	Prove that Vertex Cover Problem is NP-Complete and design an approximation algorithm for same. **OR** Prove that TSP Problem is NP-Complete and design an approximation algorithm for same.	[08] [08]
Q4 (b)	What is Indicator Random Variable (IRV)? Why it is used? Perform IRV analysis of Hiring Problem using N^{th} Harmonic Series.	[07]
Q5	**Write a short note on any Three.** i. Amortized Analysis using Potential Method on Stack ii. P, NP, NPC and NPH classes of Algorithm iii. Satisfiability (3 SAT) iv. Big-O, Small-o, Omega , small Omega and Tilde	 [05] [05] [05] [05]

All the Best!