

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.Tech Degree S2 (R,S) (FT/WP) Examination May 2025 (2022 scheme)



Course Code & Name: 222TCS100 ADVANCED DATA STRUCTURES AND ALGORITHMS

Max. Marks: 60

Duration: 2.5 Hours

PART A*Answer all questions. Each question carries 5 marks*

Marks

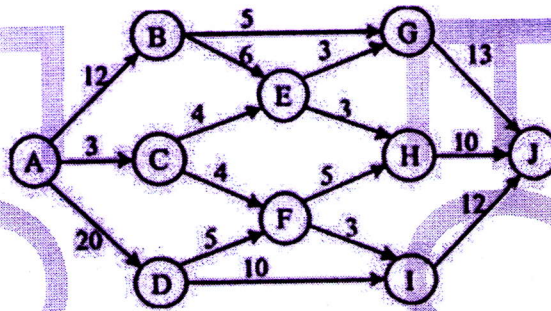
- 1 Suppose a sequence of n operations on a data structure in which the i^{th} operation costs i if i is an exact power of 2, and 1 otherwise. Use aggregate analysis to determine the amortized cost per operation ? (5)
- 2 Compute the prefix function π for the pattern "abdcababdcabdc" ? (5)
- 3 A node in a Fibonacci heap is either Marked or UnMarked. What is the objective of having the mark field for a node? How is it used to meet the objective? (5)
- 4 Justify how Edmonds-Karp algorithm out performs Ford Fulkerson Method on a worst case instance ? (5)
- 5 Explain how the Miller-Rabin test determines whether a number is composite or probably prime ? (5)

PART B*Answer any 5 questions. Each question carries 7 marks*

- 6 Solve to find the total cost of executing N of the stack operations PUSH, POP, and MULTIPOP, assuming that the stack begins with S_0 objects and finishes with S_n objects using potential method ? (7)
- 7 Describe the working of KMP algorithm for string matching. Given a text and a pattern, use the KMP algorithm to find all occurrences of the pattern in the text. (7)
 - Text: "ABABDABACDABABCABAB"
 - Pattern: "ABABCABAB"

- 8 Construct a Binomial heap by inserting numbers 23, 25, 1, 3, 9, 12, 27, 33. (7)
Delete 27 from the heap. List the steps involved in the operation. ?

- 9 Show the execution of the Edmonds-Karp algorithm on the given flow network (source: A and sink: J). (7)



- 10 Implement the probabilistic Quick-Sort algorithm in a programming language of your choice. Sort the array [10, 7, 8, 9, 1, 5] and show the steps taken during the sorting process ? (7)
- 11 Consider each of the following words as a set of letters: {arid, dash, drain, heard, lost, nose, shun, slate, snare, thread}. Show which set cover GREEDY-SET-COVER produces when we break ties in favour of the word that appears first in the dictionary ? (7)
- 12 a) Differentiate polynomial-time approximation scheme and fully polynomial-time approximation scheme? (3)
- b) Illustrate the approximation algorithm for traveling sales person problem? (4)