Tutorial - 7

Ans 1. **Greedy algo paradigm** :- Greedy is an algorithm paragidm that builds up a solution piece by piece, always choosing the next piece that offers the most obvious and immediate benefits.

There are multiple applications of the greedy technique as :

1. CPU scheduling
2. minimum Spanning Tree
3. several Graph based algo's.

Ans 2.

	Activity Selection	Job Sequencing	Fractional Knapsack	Huffman Encoding
T.C =>	O(NlogN)	$O(n^2)$	O(nlogn)	O(nlogn)
S.C =>	O(n)	O(n)	O(n)	O(n).

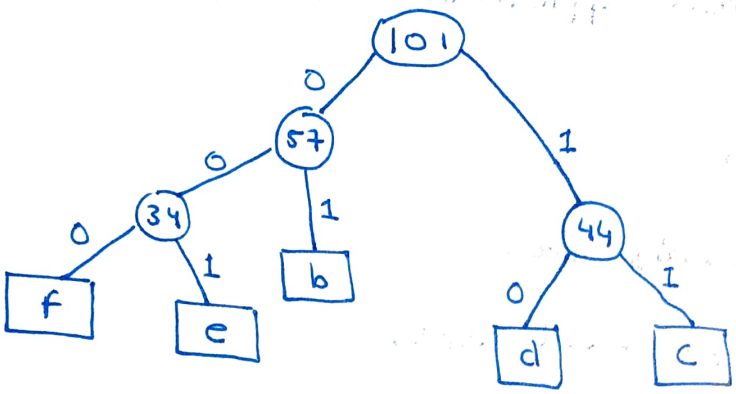
Ans 3. => Huffman Coding.

char	Frequency
a	45
b	23
c	22
d	20
e	19
f	16.

Sorted Frequency

15	19	20	22	23	45
f	e	d	c	b	a

Huffman Tree



f = 000

e - 001

b - 01

d - 10

c - 11

Ans 4. Data Structure used for Huffman Encoding :- Binary Tree is used for building Huffman Encoding and it is also used for Huffman Encoding.

* Application of Huffman encoding :-

1. Huffman code is used to convert fixed length code into variable length codes which result in lossless compression.
2. Compressed code may be further compressed using JPEG and MPEG to get the desired compression ratio.

Ans 5. $W = 15$

Value	10	5	15	7	6	18	3
weight	2	3	5	7	1	4	1
v/w	5	1.6	3	1	6	4.5	3

- Choose highest v/w ratio for which weight $w \leq W$
- Let weight = c

X = | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

c = 1

X = | 1 | 0 | 0 | 0 | 1 | 0 | 0 |

c = 3

X = | 1 | 0 | 0 | 0 | 1 | 1 | 0 |

c = 7

X = | 1 | 0 | 1 | 0 | 1 | 1 | 0 |

c = 12

X = | 1 | 0 | 1 | 0 | 1 | 1 | 1 |

c = 13

X = | 1 | 2/3 | 1 | 0 | 1 | 1 | 1 |

next highest weight is 1.6

which has 3 unit weight, but c + 3 ≯ 15.

hence, we will fraction it as per requirement

required weight = W − c = 15 − 13 = 2.

hence weight added = $\frac{2}{3}$.

xw =

2	2	5	0	1	4	1

$\Sigma x_i w_i = W$

vx =

10	3.3	15	0	6	18	3

$\Rightarrow$ max. profit / max. value = $\Sigma . v_i x_i$

$\Rightarrow 55$

Ans 6. -> Knapsack Algo :- To solve the problem we take the value/weight ratio and on the basis of this ratio a weight is which has highest v/w ratio added to the knapsack until we can't add the next weight as a whole and that point of time we take the required fraction of the weight and add it to the knapsack. This is nothing but greedy approach of taking the highest ratio everytime.

Huffman Coding :- It is based on the frequency of the character. We assign the variable length code to input characters, length of the assigned codes are based on the frequencies of corresponding characters. Hence, it is a greedy approach as we are using a predefined structure everytime to solve the problem

Ans 7.

	a	b	c	d	e	f
start time	1	2	0	6	9	10
End time	3	5	7	8	11	12

Timeline

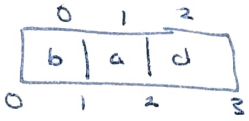
included process → a, d, e

Max. no. of process = 3

Ans 8.

	a	b	c	d	e
profit	20	15	10	5	1
deadline	2	2	1	3	3
			×		

Timeline



profit → 20 + 15 + 5 = 40

Ans 9. Greedy Algos are not suitable for problem where a solution required for every subproblem like sorting. In such problems, the greedy strategy can be wrong, is the worst can ever lead to a non optimal solution.