

**(a)** A thief enters a house to rob and he can carry a maximum weight of 5 kg in his bag. There are 4 items in the house with the following weights and values. What items should the thief take if he either takes the item completely or leaves it completely? (7M)

Item	Weight (kg)	Value (\$)
Mirror	2	3
Silver nugget	3	4
Painting	4	5
Vase	5	6

**(b)** The Jobs, their Deadlines and associated Profits are shown in the Table given below. Then You are asked to Answer the following. (8M)

- What is an Optimal Schedule that gives the Maximum Profit?
- Are all the Jobs completed in an Optimal Schedule?
- What is the Maximum earned Profit?

Jobs	J1	J2	J3	J4	J5	J6
Deadline	5	3	3	2	4	2
Profits	200	180	190	300	120	100

**(a)** Find the Best Sequence Alignment between Sequences ATGCT and AGCT, where the Scoring Scheme is +1 for Match, -1 for Mismatch and -2 for an Alignment with a Gap. **(5M)**

**(b)** The Maximum Weight the Knapsack can hold is  $W (=11)$ . There are five items to choose from the list. The weights( $w$ ) and values( $v$ ) of these items are presented in the following table:

$w_1=1$	$v_1=1$
$w_2=2$	$v_2=6$
$w_3=5$	$v_3=18$
$w_4=6$	$v_4=22$
$w_5=7$	$v_5=28$

Apply Dynamic Programming Approach for Solving 0/1 Knapsack Problem and Find the Maximum Value of Items in the Knapsack. The method which is described above does not tell which subset gives the Optimal Solution. Hence, how to Compute the Actual Subset? Explain it with Pseudocode. **(10M)**

Design an algorithm to ship the goods with the maximum container capacity  $W$ . Consider a set  $S$  for  $n$  number of items and Weight as  $W$ . Every item has a specific price and weight, and people in business want to ship a set of items with the highest profit and write the formula for weight criteria and profit. Derive the recursive relation for the same.

**(a)** The food industry makes two types of products P1 and P2. Each unit of P1 requires 9 units of ingredient M1 and 1 unit of ingredient M2. Each unit of P2 requires 12 units of ingredient M1 and 3 units of ingredient M2. The number of units of M1 and M2 available are 180 and 30 respectively. Profitability for the industry is Rs 8000 for each unit of P1 and Rs 12000 for each unit of P2. Determine the number of units of P1 and P2 that will be manufactured per week in order to maximise profit. What is the maximum weekly profit? Formulate this as a Linear Programming Problem and Solve it Graphically. [7 M]

**(b)** Find the optimal assignment of jobs to the workers in the following assignment problem using Branch-and-Bound Method. Show all the steps with a State Space Tree. **(3 M)**

	J1	J2	J3
W1	10	2	7
W2	6	4	3
W3	7	6	10