CHUKA   UNIVERSITY

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF SCIENCE,
BACHELOR OF SCIENCE APPLIED COMPUTER SCIENCE**

COSC 333: DESIGN AND ANALYSIS OF ALGORITHSMS

STREAMS: BSC (COSC, ACSC)   Y3S2   **TIME: 2 HOURS**

DAY/DATE: THURSDAY 09/04/2020   **8.30 AM – 10.30 AM**

INSTRUCTIONS:

- Answer **QUESTION 1** and any other **TWO QUESTIONS** from section B.
- This is a CLOSED BOOK EXAM, No reference materials allowed.
- No use of mobile phones
- Write you answer legibly and use your time wisely.
- Scientific non programmable calculators may be used

SECTION A: COMPULSORY

Question one: 30 Marks

a. Loop invariants are used to determine the correctness of an algorithm. Discuss.   [4mks]

b. Dynamic Programming is one of the algorithm design techniques; explain the basic elements that characterize this approach.   [4mks]

c. Explain the differences between Algorithm and Pseudocode   [4mks]

d. Discuss the characteristics that a good algorithm should have.   [6mks]

e. Analysis of algorithms means predicting the resources that the algorithm requires. Discuss.   [6mks]

f. Dynamic Programming (DP) is not applicable to all optimization problems. There are some important elements that problem must have in order for DP to be applicable. Explain. [6mks]
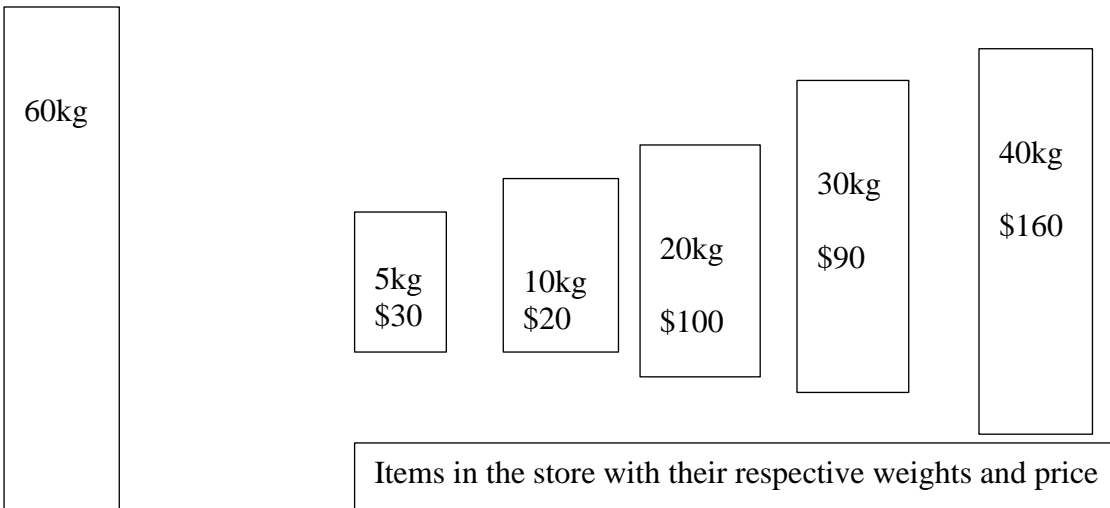
SECTION B: (CHOOSE ANY TWO QUESTIONS FROM THIS SECTION)

QUESTION TWO

a. The Order of growth (big Oh) is the rate of growth of the running time of an algorithm. Discuss this based on Insertion Sort algorithm [8mks]

b. Longest common subsequence involves determining if similar subsequences exists between a set of strings. Derive a Dynamic programming formulation for finding the Longest common subsequence over a string of characters.
[12mks]

QUESTION THREE 20 MKS

a. Discuss the nature of divide and conquer algorithms and give examples of algorithms that utilize this technique in solving computer problems [8mks]

c. A thief is robbing a store, where he finds a number of items to be taken. Each item is worth certain dollors and has got some weight. The thief is carrying a Knapsack that can only accommodate a maximum weight of 60Kg.
Use the illustrations below to answer the questions that follows:

60kg

40kg
$160

30kg
$90

20kg
$100

10kg
$20

5kg
$30

Items in the store with their respective weights and price

knapsack

What is the maximum value of goods that the theif can carry if he assumes the following:
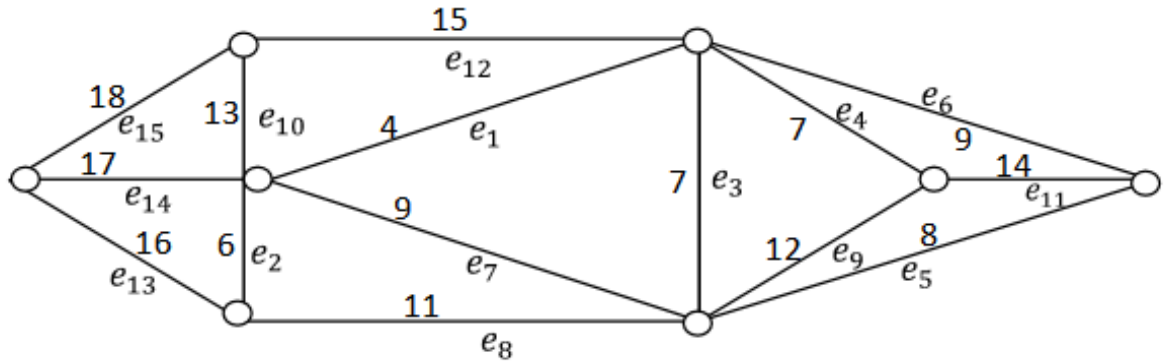
(i) Gready solution to fractional problem [4mks]
(ii) Gready solution to 0-1 problem [4mks]

(iii)   Optimal solution to 0-1 problem   [4mks

QUESTION FOUR 20 MKS

a. Using Kruskal's and Prims algorithms, obtain a minimal spanning tree for the graph
   given   [16mks]

b. Explain the application areas of binary trees   [4mks]

QUESTION 5 [20 MKS]

(a)   Discuss the complexity of an algorithm   **[8mks]**

(b) Given a Chain of 6 matrices with their dimensions shown as follows:

A1=30X35
A2=35X15
A3=15X5
A4= 5X10
A5=10X20
A6=20X25

Determine the optimal sequence for multiplying this matrix and Cleary show your workings.
                                                                        [12mks]