ASSIGNMENT BOOKLET

(Valid from 1ˢᵗ January, 2022 to 31ˢᵗ December, 2022)

M.Sc. (Mathematics with Applications in Computer Science)

PROGRAMMING AND DATA STRUCTURES

ignou
THE PEOPLE'S
UNIVERSITY

School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068
(2022)

Dear Student,

Please read the section on assignments in the Programme Guide for Elective Courses that we sent you after your enrolment. A weightage of 20%, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this course. The assignment is in this booklet.

Instructions for Formating Your Assignments

Before attempting the assignment please read the following instructions carefully.

1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ROLL NO. :………………………………………………

NAME :………………………………………………

ADDRESS :………………………………………………

………………………………………………

………………………………………………

COURSE CODE: …………………………….

COURSE TITLE : …………………………….

ASSIGNMENT NO.: …………………………….

STUDY CENTRE: …………………….…….. **DATE:** ...……………….………………...

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3) Leave 4 cm margin on the left, top and bottom of your answer sheet.

4) Your answers should be precise.

5) While solving problems, clearly indicate which part of the question is solved.

6) This assignment is to be submitted to the Study Centre as per the schedule made by the study centre. We strongly suggest that you **retain a copy of your answer sheets**.

7) This assignment is valid only upto **December**, **2022**. If you have failed in this assignment or fail to submit it by December, 2022, then you need to get the assignment for the year 2023 and submit it as per the instructions given in the programme guide.

8) **You cannot fill the exam form for this course** till you have submitted this assignment. So solve it and **submit it to your study centre at the earliest.**

We wish you good luck.

Assignment

d) Consider the program given below:

```
#include <stdio.h>
int main()
{  int a;
   a=10, 20, 30;
   printf("a=%d\n", a);
   a=(10, 20, 30) ;
printf("a=%d\n", a);
return 0;
}
```

If you execute it you will find that its output is

a=10
a=30

Discuss why the output has **a=10** in the first line and **a=30** in the second line.   [3]

3. a) Explain the difference between the **logical and** (&&) and the **bitwise and** (&) operators
   with the help of an example.   [3]

   b) Find the output of the program given in E6 of Unit 8. Does this make you clear about
   the use of the **extern** variable?   [4]

   c) Write the definition of the following recursive function.

   $$f(n, k) = f(n - 1, k) + f(n - 1, k - 1), \text{ where } f(n, 0) = f(n, n) = 1, \forall n \geq 0.$$

   Also write the main program that calls this function to print $f(n, k)$ for $k = 0, 1, 2, ..., n$
   for a given value of n. What do these values remind you?
   Now include a counter variable in the function that counts how many times the function
   called itself in a single call from main. (Notice how much time the compiler takes when n
   is taken bigger and bigger.)   [6]

   d) Write a simple program to check whether a user-entered character is a vowel or not.   [3]

   e) Write the output of the program given in E24 of Unit 6. Hence discuss the scope of the
   variables used therein.   [4]

4. a) Explain with the help of an example how will you read a sentence using `scanf()`. [3]

   b) Consider the program 10.14 in the Unit 10. The function `result(...)` computes the
   product of two complex numbers passed to it. Modify this function so that it can compute
   the modulus of a complex number. Your function should use the **arrow** operator instead
   of the **dot** operator.   [4]

   c) Write a function `maximum(...)` with variable length argument list to return the
   maximum of the arguments passed to it.   [3]

   f) Consider the function `insertion_sort(...)` given in the solution of E3 of Unit 11.
   Suppose this function is called in the main program as follows:
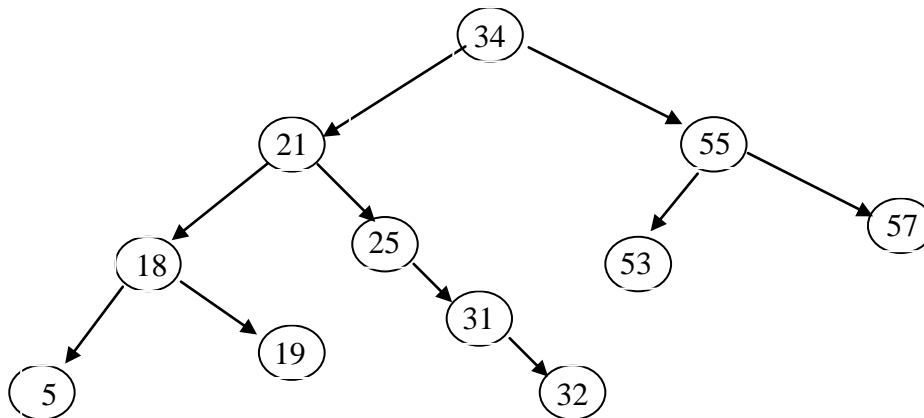   `insertion_sort(a, 5);`
   where `a` is an array containing the elements {2, 5, 3, 7, 6}.
   Describe step by step the how this function works.   [5]

4

5. a) Write a C program that reads an array of integers from keyboards and prints the number of integers divisible by 2 or 3. [3]

b) Consider the Example 5 of Unit 12. Write the `main( )` function which calls the function `add_term(…)` to read the following polynomial:
$$2x^3 + 3x^2 + x - 1.$$
Also write a function `display(…)` which displays the polynomial in the following format: [7]

Coefficient	Degree
2	3
3	2
1	1
-1	0

6. a) Evaluate the expression $2, 3, +, 5, 6, /, -, 1, 2, \%, -$ in RPN. [4]
.

b) Write a C program that creates an empty queue, inserts elements at the rear of the queue and prints the elements of the queue. [6]

7. a) Manually provide the inorder, preorder and postorder traversals of the following binary search tree [6]

b) Beginning with an empty binary search tree, what binary search tree is formed when the following data is inserted in the order given?
$$8, 13, 6, 10, 21, 19.$$ [4]

c) Explain the procedure of deletion of a node in a binary search tree with the help of an example. [5]

***