

SCHOOL OF SCIENCE & MEDICINE

Exam Title: **PROBLEM SOLVING AND PROGRAMMING 2**

SPRING 2017

EXAMINATION FOR THE DEGREE PROGRAMMES IN

BSC Computing September 2016 and January 2017

Exam Code: 20172AIAP014AWP

TIME ALLOWED: **2 HOURS**

MATERIALS PERMITTED: None

MATERIALS PROVIDED: Word sheet will be provided electronically
in the exam folder

INSTRUCTIONS:

1. Answer ALL FOUR questions, for question 1 and 4 you need to answer only one section from each
2. This examination requires both written work in the answer book as well as practical work on the computer.
3. Be tidy with your written work. Marks may be deducted for untidy work.
4. You must save your practical work on the designated disk drive on the desktop of your computer.
5. You must organise your answers into folders, one folder for each question. Do not provide more than one answer to each question.
6. You may use the file "ExamReferencePSP2" on the P drive for a quick reference of some aspects you might need to solve the questions.

Question 1 (practical) (25 marks)**Answer either section 1 or section2****Section 1:**

A. Define a Bird structure that contains the following fields:

- Bird Name
- Bird colour
- Max Age
- Can swim
- Can fly

B. Create a variable for the structure above, populate suitable data in this variable.

C. Create an array of ten birds, then insert six birds into the array.

D. Write a function to search for a bird based on the bird name.

E. Write a function to print the content of the array to the screen.

(A:5, B:5, C:5, D:5, E:5) marks

Section 2:

Using the two lists shown below, write a C program project:

ListA={'A', 'B', 'C', 'D', 'E', 'F'} ListB={'E', 'F', 'G', 'H', 'I', 'J'}

A. Write a function called READ to populate the given letters in two linked lists.

B. Write a function called FIND, this function used to verify if a letter is belong to the list or not.

C. Write a function called INTERSECT that can populate the interacted values from the two lists above in one new linked list.

i.e. Intersection list will be: INTERSECT = {'E', 'F'}

D. Write a function called UNION that can populate the values of both lists above in one new linked list, then remove the duplicates.

i.e. Union list will be: UNION = {'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J'}

(A:6, B:6, C:6, D:7) marks

Question 2: (Written) (25 marks)

Using figure 1 select the right option from the following:

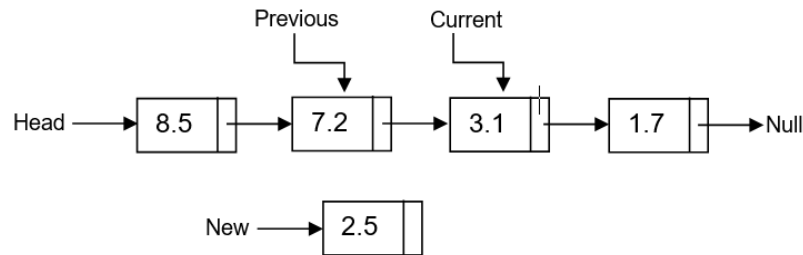


Figure 1

- A. Which code can be used to insert the New node containing 2.5 at the beginning of the list:
 1. Head->next =New;
 2. Head = New; New = Head->next;
 3. New->next = Head; Head = New;
 4. if none of the above you need to write your code.
- B. Which code can be used to insert the New node containing 2.5 between the nodes containing 7.2 and 3.1:
 1. Previous== New; New->next = Current;
 2. New->next = Previous->next; Previous->next =New;
 3. Previous->next = New; New->next = Current->next;
 4. if none of the above you need to write your code.
- C. Which code can be used to delete the node containing 3.1:
 1. Current = Null;
 2. Previous = Current->next; Current = Null
 3. Previous->next = Current->next;
 4. if none of the above you need to write your code.
- D. Which code can be used to delete the node containing 8.5:
 1. Head = Head->next; Head = Null
 2. Head = Previous->next; Head = Null;
 3. Head = Previous; Head = Null;
 4. if none of the above you need to write your code.

(6 to 7 marks each)

Question 3: (Written) (25 marks)

Using the binary tree in Figure 2 below, answer the following:

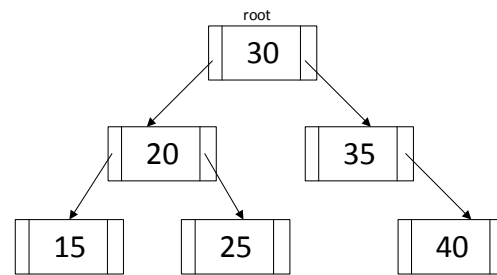


Figure 2

- A. After adding a node containing 45 to the binary tree above, is the tree become a balanced tree? Explain why?
- B. Explain the needed steps to delete the node containing 35.
- C. Explain the necessary steps to update the node with value 15 to 22.
- D. Write a C function that can traverse all the nodes using pre-order traverse and print out their values.
- E. Write a C function that can be used to search for a value in the tree.

(A:5, B:5, C:5, D:5, E:5) marks

Question 4 (written) (25 marks)**Answer either section 1 or section 2****Section 1:**

Hashing is one of the important searching methods that used in some systems. You are asked to design a hashing system for one of the car dealer. The car dealer has around 70 to 100 cars at a time. The dealer would like to retrieve the cars based on their registration numbers, as an example for the UK registration number (NK60 DDY, CN14 AAB). So the number consist of two letter at the beginning followed by two digits then three letters.

- A. Design a hashing table that can accommodate the future growth of the car dealer.
- B. Design a hashing function that can use the registration number as a key.
- C. Design a rehashing function that can be used to produce as minimum clashes as possible,
- D. Justify your answers by giving a suitable example.

(A:6, B:6, C:6, D:7) marks

Section 2:

Organising and scheduling printing jobs are an essential operation developed in most of the operating systems. Design a dynamic structure that allows the system to accept unlimited number of users and allocate a list of unlimited numbers of printing jobs. This kind of system can be presented in figure 3 below.

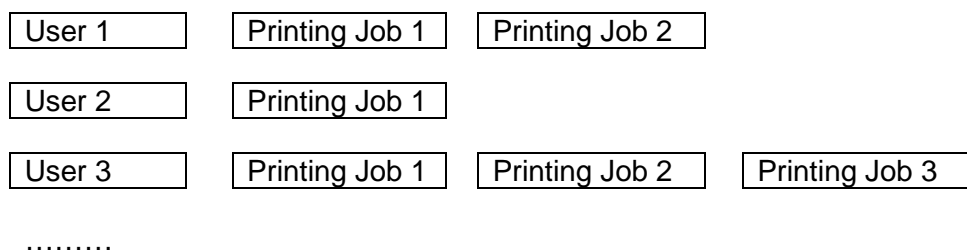


Figure 3

- A. Create a suitable structure that can present the above printing system.
- B. Insert at least two users with at most two printing jobs for each.
- C. Print the related data for each user.

(A:9, B:8, C:8) marks

- END OF PAPER –