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COM 2005 Data Structures
Midterm Exam, 16.11.2017, 13:00
Duration : **90** Minutes

NUMBER : ..... NAME : ..... SIGNATURE :	EXAM GRADE	
	[.....]	.....

Students have to obey Engineering Faculty Exam Execution Instructions.
Questions are related to 1,4,12 of Program Learning Outcomes.

```
void SinglyLinkedList::removeBack()
{
   if (head == NULL)
   {
      cout << "List is empty !" << endl;
      return;
   }

   SinglyNode* prev = head;

   if (prev->next == NULL)
   {
      head = NULL;
      delete prev;
   }
   else
   {
      while (.....)
            .....
      .....
      .....
   }
}
```

1. Which one of the following choises for the **.....** lines of the function **removeBack()** that removes a node from the end of a singly linked list? **(25P)**

*You'll loose **5P** from wrong answer*

(A)
```
while (prev->next->next != NULL)
      prev = prev->next;
prev->next = NULL;
delete prev->next;
```

(B)
```
while (prev->next->next != NULL)
      prev = prev->next;
delete prev->next;
prev->next = NULL;
```

(C)
```
while (prev->next != NULL)
      prev = prev->next;
delete prev->next;
prev->next = NULL;
```

(D)
```
while (prev->next != NULL)
      prev = prev->next;
prev->next = NULL;
delete prev->next;
```

2. Suggest an improvement in the node (has left/right child) deletion algorithm to obtain a balanced tree. **(25P)**

```
void tree(int i, int j, int p, int n, int k)
{
      if (i < 1) return;

      ..................

      if (n == k)
            ..............................
      else
            tree(i, j + p, p, n + 1, k);
}

int main()
{
      tree(8, 8, 16, 1, 1);
}
```

3. Which one of the following choises for the ..... lines of function outputs **8 4 12 2 6 10 14 1 3 5 7 9 11 13 15** **(25P)** *You'll loose **5P** from wrong answer*

(A)
```
cout << i << endl;
tree(i / 2, i / 2, p / 2, 1, k * 2);
```

(B)
```
cout << i << endl;
tree(i / 2, j / 2, p / 2, 1, k * 2);
```

(C)
```
cout << j << endl;
tree(i / 2, i / 2, p / 2, 1, k * 2);
```

(D)
```
cout << j << endl;
tree(i / 2, j / 2, p / 2, 1, k * 2);
```

```
void print(DoublyNode* first, DoublyNode* last)
{
   if ((first->elem.compare(last->elem)== 0)
      && (first->score == last->score))
         cout << first->elem << endl;
   else
      print(first->next, last->prev);
}

int main()
{
   DoublyLinkedList list;

   list.insertOrdered("Paul", 720);
   list.insertOrdered("Rose", 590);
   list.insertOrdered("Anna", 660);
   list.insertOrdered("Mike", 1105);
   list.insertOrdered("Rob",  750);
   list.insertOrdered("Jack", 510);
   list.insertOrdered("Jill", 740);

   list.print(
     list.header->next,
     list.trailer->prev);
}
```

4. What is the output of the program above? **(25P)**