**Question 1**

a) Describe the purpose of the following three Windows system libraries:

i. Kernel32.dll.
ii. GDI32.dll.
iii. User32.dll.  

(6 marks)

b) List and describe two functions in each of the system libraries listed above (six in all). Your answer should also include a short description of the main parameters in each of these functions.

(9 marks)

c)  

i. What is a **callback function**?

ii. How is a callback function associated with a window?

iii. The callback function associated with a window is usually called \textit{WndProc}. List and briefly describe the parameters of this callback function.

(6 marks)

d) Describe the parameters passed to the \textit{WinMain} entry point function.

(2 marks)

e) Describe the parameters passed to the \textit{DllMain} entry point function.

(2 marks)

*[Total: 25 marks]*
**Question 2**

a) In pseudo-code, but using the correct API calls and their parameters, implement a stack data structure using heap API calls to dynamically allocate memory. Your data structure should stack elements of the following `struct` type:

```c
struct Point
{
    int X;
    int Y;
}
```

Hint: your implementation should include functions to initialise the stack, shut it down by releasing all the memory it uses, as well as pushing and popping items on the stack.

(15 marks)

b) What is the purpose of the `GlobalAlloc` and `GlobalFree` functions?

(2 marks)

c) How does thread scheduling work in the Windows operating system. In your answer make sure to mention:

i. Thread priority value ranges.
ii. Thread starvation.
iii. Base and relative priorities.
iv. Priority ‘boosting’.
v. Any API calls required to change the priority of a thread.

(8 marks)

**[Total: 25 marks]**
Question 3

a) How are accelerators created, loaded and trapped in the message loop of a window?  
   (8 marks)

b) What is a mapping mode? In your answer give an example of three mapping modes and describe how a mapping mode is set for a device context.  
   (3 marks)

c)
   i. How is a timer created and associated with a window?  
   ii. Timer code can either reside in its own callback function or in the main callback function. How can this property be set by a programmer?  
   iii. How can a timer be paused?  
   (6 marks)

d) Write short notes on the following:
   i. Device Contexts.  
   ii. WM_COMMAND.  
   iii. lpszMenuName (in the Window Class structure).  
   iv. Virtual Address Spaces.  
   (8 marks)

[Total: 25 marks]