Problem 1 (40 points: Each question 5 points)

Q.1
Consider the following:

```
Var1 BYTE 15 DUP(2, 3, 5 DUP(11, 12))
```

This statement will:

A. Allocate 150 bytes in memory
B. **Allocate 180 bytes in memory**
C. Allocate 75 bytes in memory

Q2, 3 and 4
Consider the following:

```
data
Var1 BYTE 12h, 13h, 14h, 15h, 16h, 17h, 18h, 19h
Var2 LABEL WORD
Var3 LABEL DWORD
Num EQU 5
Var4 BYTE 22h, 23h, 24h, 25h, 26h, 27h, 28h, 29h
```

Q.2
What is the value contained in AX after the execution of the following statement:

```
MOV AX, OFFSET Var3
```

A. **0008h**
B. 000Ah
C. 0001h

Q.3
What is the value of register BX after the execution of the following instruction:

```
MOV BX, Var2+6
```

A. 2726h
B. 2827h
C. **2928h**
Q.4
What is the value of register EBX after the execution of the following instruction?

```
MOV EBX, Var3
```

A. 29282726h
B. 25242322h
C. 27262524h

Q5, 6, 7 and 8
Consider the following:

```
.data
Var1 BYTE 0Ch, 0Dh, 0Eh, 0Fh
Var2 WORD 0Ch, 0Dh, 0Eh, 0Fh
Var3 DWORD 0Ch, 0Dh, 0Eh, 0Fh
Msg BYTE 'Virtually'
```

Q.5
Compute the address that should be used to access the letter ‘V’ in the word ‘Virtually’

The address is 4 bytes + 4 word + 4 double words = 4 + 8 +16 = 28d = 001Ch

Q.6
Compute The address that should be used to access the second ‘l’ of the word ‘Virtually’.

The address is Address of letter ‘V’ + 7 = 28 +7 = 35d = 0023h

Q.7
What is the value of the register AX after the execution of the following instruction:

```
MOV AX, Var2+2
```

A. 000Ch
B. 0C0Dh
C. 000Dh

Q.8
What is the value of the register EAX after the execution of the following instruction:

```
MOV AX, TYPE Var3
```

A. 2
B. 4
C. 8
Problem 2 (40 points)
Consider the following:

.data
  Table1  BYTE  8, 10h, 9, 20h, 10, 23h, F6h, 22h, 16h
  NumE   EQU  LENGTHOF Table1
  Array   DWORD 01h, 02h, 03h, 04h

1. Consider the following statement: (10 points)
   
   MOV EAX, NumE

   The addressing mode of operand NumE is:
   A. Direct
   B. Immediate
   C. Register

   Justify your answer:
   The NumE label is defined as an EQU statement which is used to define constants and do not have any representation in memory. So NumE is a value and not a memory location. Therefore, any reference to it is made as a reference to a constant.

2. Consider the following statement: (10 points)
   
   MOV NumE, EBX

   Is this a correct statement?
   A. Yes.
   B. No.

   Justify your answer.
   It is impossible and not consistent to have a constant as a destination for a MOV operation.

3. Consider the following statement: (10 points)
   
   MOV EAX, Table1 + LENGTHOF Table1

   is equivalent to:
   
   MOV EAX Array

   Is this correct?
   A. Yes.
   B. No.

   Justify your answer:
   Because Table1 is defined before Array, so the location pointed to by Table1 + LENGTHOF Table1 is actually the same as Array1. This is also possible because the statement that defines NumE does not generate any reservation in memory.
4. We want to move the second word in the double word “Array” to the register BX. Write the statement that will achieve that. (10 points)

    MOV BX WORD PTR Array+2
**Problem 4 (30 points)**

Consider the following data allocation statements:

```assembly
.data
Var1 BYTE 0Ch, 0Dh, 0Eh, 0Fh
Var2 WORD 0Dh, 0Eh, 0Fh, 0Ah
Var3 DWORD 0Eh, 0Fh, 0Ah, 0Bh
Var4 LABEL WORD
Var5 LABEL DWORD
Msg BYTE 'Virtually'
Table1 BYTE 5 DUP(27,35h)

Please fill the content of the following table to show the effect of the statements above.

<table>
<thead>
<tr>
<th>Label</th>
<th>Address</th>
<th>Data</th>
<th>Label</th>
<th>Address</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Var1</td>
<td>0000</td>
<td>0Ch</td>
<td>0018</td>
<td>0Bh</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0001</td>
<td>0Dh</td>
<td>0019</td>
<td>00h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0002</td>
<td>0Eh</td>
<td>001A</td>
<td>00h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0003</td>
<td>0Fh</td>
<td>001B</td>
<td>00h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0004</td>
<td>0Dh</td>
<td>001C</td>
<td>'V'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0005</td>
<td>00h</td>
<td>001D</td>
<td>'i'</td>
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</tr>
<tr>
<td></td>
<td>0006</td>
<td>0 Eh</td>
<td>001E</td>
<td>'r'</td>
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</tr>
<tr>
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<td>0007</td>
<td>00h</td>
<td>001F</td>
<td>'t'</td>
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</tr>
<tr>
<td></td>
<td>0008</td>
<td>0Fh</td>
<td>0020</td>
<td>'u'</td>
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<td>0009</td>
<td>00h</td>
<td>0021</td>
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<tr>
<td></td>
<td>00A</td>
<td>0Ah</td>
<td>0022</td>
<td>'l'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>00B</td>
<td>00h</td>
<td>0023</td>
<td>'l'</td>
<td></td>
</tr>
<tr>
<td>Var2</td>
<td>000C</td>
<td>00h</td>
<td>Table1</td>
<td>0025</td>
<td>1Bh (= 27d)</td>
</tr>
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<td>000D</td>
<td>00h</td>
<td></td>
<td>0026</td>
<td>35h</td>
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<td>00h</td>
<td></td>
<td>0027</td>
<td>1Bh</td>
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<td>35h</td>
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<tr>
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<td>0010</td>
<td>0Fh</td>
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<td>0029</td>
<td>1Bh</td>
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<td>0011</td>
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<td>002A</td>
<td>35h</td>
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<td>1Bh</td>
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<td>?</td>
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<td>00h</td>
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