Macro

```
.model small
.code
   Mov AH,2
   Mov DL,66
   rept 5
     Int 33
   endm
   Mov AH,76
   Int 33
end
```

```
Mov AH,2
t=66
rept 5
   Mov DL,t
   Int 33
   t=t+1
endm
Mov AH,76
Int 33
```

The first program prints BBBBB

1. Modify it to print BBBBBaaaaa [Hint: one more rept]
2. Print BCDEF [Hint: use Add DL,1]
3. Print BaBaBaBaBa [Hint: In rept use Mov DL,66 and Mov DL,97. Use two Int 33]
4. The program outputs 5B's in separate line.

The second program prints BCDEF. Modify it to print

5. Print BaCaDaEaFa
6. Print BaCbDcEdFe [Hint: one more variable p (initially 97)]
7. (A) Print BCEHLQ (B) Print BGKNPQ

```
Mov AH,2
t=5
rept 5
  Mov DL,t+65
  rept t
    Int 33
  endm
  t=t-1
  Mov DL,','
  Int 33
endm
```

The given program outputs FFFFF,EEEE,DDD,CC,B

Write program to output following

8. FEDCB,FEDCB,FEDCB,
9. F,EE,DDD,CCCC,BBBBB,
10. FFF,EEEE,DDDDD,CCCCCC,
11. ABCDE,BCDE,CDE,DE,E,
12. ABC,DEF,GHI,JKL,MNO,
13. AAAAA,AAAABBBB,AAABBBCCC,AABBCCDD,ABCDE
14. A;ABA;ABCABA;ABCDABCABA;ABCDEABCDABCABA

```
rept 4
  Mov AH,1
  Int 33
  Mov DL,AL
  ADD DL,1
  Mov AH,2
  Int 33
endm
Mov AH,76
Int 33
```

The given program reads 4 letters. After reading every letter it outputs the next letter

15. Read 4 letters. In the first letter add 1, in the second add 2 and so on.
16. Read 10 digits. Output the letter, whose ascii code is their sum. Input 5723783456 output 2. Since sum is 50.
17. Read a digit. Output the letter, whose ascii code is 10 times. Input 7 output F. Input 9 output Z.
18. Read 10 letters and output them in reverse order. [Hint: use Push]
19. Read 8 letters. After reading every letter print the previous letter. I/p aqwertyu o/p a(Z)q(a)w(q)e(w)r(e)t(r)y(t)u(y) After first letter Z.

20. Read a letter. Let its ascii code be x. Output x mod 7. Input ‘F’ output ‘0’. i/p d o/p 2.
21. For above case output x div 10. Input ‘b’ output ‘9’. Input ‘Y’ output ‘8‘.
22. Read letters till a letter ‘a’ is given. Output the number of letters. Assume that the number of letters is less than 10. Input trda output 3.
23. Read letters till ‘a’ is given. Output the last letter before ‘a’. Input pwrtydsa output s.
24. Read two digits. Print the letter whose ASCII code is their product. Input 89 output H.
25. Read 10 digits. Print letter whose ASCII code is $1d_1+2d_2+3d_3+\ldots+10d_{10}$. Input 5720006000 Output C because 1*5+2*7+3*2+7*6=67.

Macro

```
abc macro x
  if x eq BL
    mov dl,65
  else
    mov dl,66
  endif
endm
.model small
.code
 Mov  AH,2
 abc  BL
 int   33
 abc  CL
 int   33
 Mov AH,76
 int   33
END o/pAB [1]
```

```
aa macro x
  x dl,bl
endm
.model small
.code
  Mov ah,2
  Mov bl,30
  aa mov
  aa add
  aa add
  Int   33
  Mov AH,76
  Int   33
END  o/p Z [2]
```

```
abc macro x
  Mov dl,65+x
   Int  33
endm
pqr macro x
  Mov dl,66
  Int  33
endm
ttt macro x
  x 5
endm
.model small
.code
 Mov AH,2
 ttt   abc
 ttt   pqr
 Stop
END  o/pFB [3]
```

```
.model small
.code
Mov  AH,2
Mov  DL,0
n=65
Jmp   L1
n=n+1
Add  DL,5
L1:
Add   DL,n
Int    33
Mov  AH,76
Int    33
End B(not A)[4]
```

```
abc macro
local n
  n=70
  Mov  DL,n+3
  Int  21h
  n=80
endm
.model small
.code
 n=65
 Mov  AH,2
 abc
 Mov  DL,n
 Int    33
 Stop
END
o/pIA  IP~~Local~~
```

```
u macro
  Mov DL,66
 Int 33
endm
t macro
  u macro
    Mov DL,65
   Int  33
  endm
endm
.model small .code
 Mov AH,2
 u
 t
 u
 Stop
End  o/p  BA
```

1,2,3:register, instruction, macro may be parameter 4:Macro expansion and execution are different passes

```
abc macro n
      Mov   DL,n
endm
.model small
.code
  Mov  AH,2
  Mov  CL,90
  abc   CL
  Int    33
  Mov  DL,CL
  Mov  DL,90
  Mov  DL,cs:[9]
  Int    33
  Mov  DL,cs:[11]
  Int    33
  Mov  DL,cs:[5]
  Int    33
  Stop
```

```
.model small
.code
  m=50
  t=65
  if m gt t
    Mov  CL,kk
    t=t+1
  else
    Mov  DL,t
  endif
  Mov  AH,2
  Int    33
  Mov  AH,76
  Int    33
End  o/pA
because of Mov
CL,kk  no error
```

```
.model small
.code
  Mov BL,50
  t=65
  Cmp BL,t
  JNG  L
  Mov  CL,kk
  t=t+1
  Jmp  M
L:Mov  DL,t
M:Mov AH,2
  Int   33
  Mov AH,76
  Int   33
END
Replace kk by
12 o/pB
 macro
```

```
ttt macro k
  Mov DL,k
  Int  33
  Int  33
endm
ppp macro t
  local ttt
  ttt macro k
    Mov  dl,k+t
     Int  33
  endm
  ttt 66
endm
.model small
.code
   Mov  Ah,2
   ttt 65
   ppp 6
   ttt 65
```

```
ttt macro
  Mov  DL,65
   Int  33
endm
ppp macro
   Mov  DL,66
   Int  33
endm
abc macro
 local ttt
 ttt macro
   ppp macro
     Mov  DL,67
     Int  33
   endm
   Mov  DL,97
   Int  33
 endm
 ttt
```

```
.model small
.code
  Mov AH,2
  ttt
  ppp
  abc
  ppp
  ttt
  ppp
  Stop
END
ABaZCAC
Replace
ttt      before
mov   DL,90
by ppp
ABBZBAB
~~Local~~ABaZCaC
```

End Z(209)Z(209) abc CLMov DL,CL ~~Mov DL,90~~	next program has error	expansion is done first	Stop end AAHAA AAHG(no local)	Mov DL,90 Int 33 endm	ttt →ppp ABBZBaC

mov reg_1,reg_2 10001010 11reg_1reg_2 CL:001 DL:010 Mov reg,number 10110reg number

Replace 9, 11, 5 by 8, 10 and 4 respectively. output is Z(138)(178)(138)

abc macro h
Add DL,2h
Mov CL,h
endm
.model small
.code
Mov AH,2
Mov dl,49
abc 3
int 33
Stop
end o/p H.
2h→2 o/p 3
	Mov AH,2
	t=5
	Rept 3
	Mov DL,t+97
	Rept t
	Int 33
	Endm
	t=t–1
	Mov DL,';'
	Int 33
	endm
	Mov AH,76
	Int 33
	fffff;eeee;ddd;
		No jmp/add P. BBBBaaaa Q. bcdef R. BaBaBa S. abcd;abcd;
		T. d,cc,bbb, U. abc,ab,a,;bcd,bc,b,
		no jump of any type. Rept Mov Int Sub Add Adc permitted
		1. Read 9 letters. How many are less than 100? yDahEkusb→4
		2. Do above. No Adc. CBW permitted.
		3. Read a letter. ascii mod 7. [CBW ~~Not~~ And permit] A→2
		4. Ascii div 7 [~~CBW~~] A→9 0→6 3→7
		5. Read two digits output product. [CBW And permit] 98→H 95→-
		6. Read a digit x o/p 1+2+3..+x+50 2→5 6→G
		In following Rept Mov Int + = cmp JE permitted
		7. Read a digit 'd' print d A's. 4→AAAA 2→AA
		8. Read a digit print double. (assume <5) 4→8 2→4
		9. Letter+digit (Inc permit) b5→g s2→u
		10. Ascii mod 3 (assume input between 70 and 90. [mod 7, 5Mov]

.model small
.code
Mov AH,2
IRP K,<65,67,71>
Mov DL,K
Int 21h
Endm
Mov AH,4cH
Int 21h
End ACG
	abc macro p
	IFNB <p>
	Mov DL,p
	else
	Mov DL,70
	endif
	Int 21h
	Endm
	.model small
	.code
	Mov AH,2
	abc 81
	abc
	Stop
	end o/pQF
		abc macro p,q,r
		IFB <q>
		Mov DL,p+r
		else
		Mov DL,q
		endif
		Int 21h
		Endm
		.model small
		.code
		Mov AH,2
		abc 80,75,20
		abc 20,,50
		Stop
		end o/pKF
			.model small
			.code
			Mov AH,2
			K=3
			IFE K GT 12
			Mov DL,65
			else
			Mov DL,66
			endif
			Int 21h
			Mov AH,4ch
			Int 21h
			end o/p A
			IFE→IFB

```
ttt macro k
  Mov DL,k
  Int 21h
  Mov DL,k+3
  Int 21h
Endm
.model small
.code
  Mov AH,2
   ttt 67
   Mov DL,80
   Int 21h
   ttt 75
   Mov AH,76
   Int 21h
end
o/pCFPKN
```

```
.model small
.code
ttt proc
  Mov DL,BL
  Int 21h
  Add DL,3
  Int 21h
  Ret
ttt endp
main Proc
  Mov AH,2
  Mov BL,67
  Call ttt
  Mov DL,80
  Int 21h
  Mov BL,75
  Call ttt
  Mov AH,76
  Int 21h
main endp
end main
```

```
ttt macro k,t
  Mov DL,k
  rept t
    Int 21h
  endm
endm
.model small
.code
  Mov AH,2
  ttt 67,5
  Mov AH,76
  Int 21h
end
o/p CCCCC
```

Do following problems using macro/function. Total number of Int in the program should be least. Macro/Function and main program can have at most one loop.

1. RR: Macro to print k,k+1,.. using rept.
   ABCDEF,CDEFGH,FGHIJK,JKLMNO,
   Function to print BL,BL+1,..
   Total Int: 1+1+1=3
2. Rr: Main program expands (or calls) macro (or function) 4 times Total int 1+1+1=3
   ABCDEFGH,PQRSTUVW,01234567,bcdefghi
3. rR: Macro/Function to print k,k+15,k-16,…. Total Int 6+1+1=8 AP1sQa,BQ2tRb,CR3uSc,
4. rr_1: Total Int 5+1+1=7
   ADBEJ,EHFIN,CFDGL,BECFK,DGEHM