

HAL/S PROGRAMMING FUNDAMENTALS

QUIZ 10

1. True or False. In order to form a truly reentrant procedure not only must the keyword REENTRANT appear on the procedure/function block header but (with rare exceptions) all data local to the program should be declared with the AUTOMATIC attribute or defined as TEMPORARY. Ans. _____

2. True or False. Input and Assign parameters are already contained in registers, or in the stack, so that the AUTOMATIC attribute is unnecessary. Ans. _____

3. True or False. REENTRANT procedures and functions can still execute incorrectly if they modify COMPOOL data, or if they themselves call procedures or functions that are not also reentrant. Ans. _____

4. What is the 6 character generic/family name formed by the HAL/S compiler for the following compilation unit? Ans. _____
 CG1K_PROG: PROGRAM;

5. Associate the following CSECTs (identified solely by their first 2 characters) with their purpose. Use the following list: a) Stack, b) SDF, c) COMPOOL data, d) Program, procedure, or function local data, e) Program code block, f) Comsub outer code block, g) internal procedure/function code block, h) Library or Non-HAL routine, i) ZCON (32-bit address constant for invoking COMSUBS), j) QCON (32-bit address constant for invoking run-time library members), k) Process Directory Entry (1 per program/process), l) Exclusive Procedure control CSECT, m) Run-time library (RTL) data CSECT, n) Sector 0 RTL:

#0	_____	A7	_____	BT	_____
#C	_____	@0	_____	\$0	_____
#Z	_____	#D	_____	#E	_____
#P	_____	#X	_____	##	_____
#Q	_____	#L	_____		

6. True or False. The EQUATE EXTERNAL statement is used to create aliases (entry points) to HAL/S variables that can be accessed by external non-HAL modules. Ans. _____

7. True or False. In the following excerpt from a COMPOOL data will be allocated exactly in the declared order and all 6 variables will be allocated space in the #P CSECT.

Ans. _____

```
CPOOL1: COMPOOL RIGID;  
  DECLARE VECT1 VECTOR CONSTANT(1,2,4);  
  DECLARE VECT2 VECTOR INITIAL(3,5,7);  
  DECLARE IARR ARRAY(5) SCALAR CONSTANT(1,2,3,7,8);  
  DECLARE MAT1 MATRIX CONSTANT(3#1,3#2,3#3);  
  DECLARE SCALE_FACT1 SCALAR CONSTANT(55.7);  
  DECLARE RAW_SCALE SCALAR INITIAL(55.7);
```

8. True or False. The keyword RIGID is illegal on PROGRAM, PROCEDURE, and FUNCTION block header statements.

Ans. _____

9. True or False. The keyword RIGID is legal on structure declares if and only if the template to which it refers also has the keyword RIGID.

Ans. _____

10. True or False. The data CSECT produced for programs, procedures, and functions (#D) may also contain literal constants that were actually declared in one or more included COMPOOLS.

Ans. _____

11. True or False. A run-time Stack (@0) is made up of segments or “frames”. Each frame corresponds one-to-one with a HAL/S code block.

Ans. _____

12. True or False. The HAL/S compiler does not determine the size of the stack needed by a PROGRAM. It merely passes information along to the Linkage Editor as to how much stack frame space is needed by each individual code block.

Ans. _____

13. True or False. The required length for each program’s stack is calculated by an algorithm in the Linkage Editor. At run-time, FCOS will allocate a stack of the requisite size from its stack data pool just prior to dispatching the process.

Ans. _____

14. Which data items are not contained in a HAL/S stack? Ans. _____
- 15. Input and assign parameters
 - 16. User-defined temporaries (TEMPORARY)
 - 17. Variables declared with the STATIC attribute
 - 18. Compiler-generated temporaries
 - 19. EVENT variables
 - 20. Multicopy structures
 - 21. Register save areas
15. What is generally the minimum length of a HAL/S stack frame? Ans. _____
16. True or False. Variables defined as TEMPORARY within successive DO ... END groups will generally overlay each other in the stack frame. Therefore it is important to examine run-time values only at those statements at which the variable is valid. Ans. _____
17. True or False. One reason that recursion is not allowed in HAL/S is because all stacks are absolutely fixed in length. Ans. _____
18. True or False. Adding TEMPORARY data to a module that already contains TEMPORARY data may not increase the size of the overall stack because the same stack frame offsets can be overlaid by additional variables. However, adding TEMPORARY data to a block which has initially no TEMPORARY variables is certain to cause growth of the total stack size. Ans. _____
19. The AP-101 has 4 registers that can contain base addresses for memory references (R0, R1, R2, and R3). During execution of a HAL/S program which registers are generally assigned to each of the following 4 functions?
- a) This register points to the #D CSECT Ans. _____
 - b) This register points to the start of the stack frame Ans. _____
 - c) This register is used for supplemental #D addressing Ans. _____
 - d) This register is used a lot for COMPOOL access Ans. _____
20. True or False. The SCAL and SRET AP-101 instructions are used when HAL/S procedures and functions do calls and returns. They push and pop the stack automatically according to the length of the current stack frame. They also save and restore the fixed point and floating point registers. Ans. _____

21. True or False. Stacks (@0) must ALWAYS be allocated in low memory (sector 0 and 1) which is always in short supply. Program/procedure data (#D) must normally be allocated in sector 0 and 1 also, but the D DATA_REMOTE feature now allows certain #D CSECTs to be placed in higher sectors. Therefore, heedlessly creating a lot of TEMPORARY variables may in fact be counterproductive. Ans. _____

22. True or False. In evaluating various prospective HAL/S coding alternatives it is important to look at the compiler's object code listing (Phase 2) to see if certain HAL/S statements are generating an unreasonably large amount of code. The programmer can also look at the stack frame requirements of each code block to evaluate stack impacts of different alternatives. Ans. _____