1)   
   
  
 Explain why an object is an example of abstraction.  
[2]  
  
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SECTION B  
Answer all questions.

2)   
   
  
 Harry is Tired (T) depending on the following three variables:  
• Work (W)  
• Hunger (H)  
• Sun (S).  
   
Harry is tired if:  
• he works and he is hungry  
• he works and it is not sunny  
• he does not work and is not hungry.  
(a) Represent, as a single logical expression, the conditions that cause Harry to be tired.[3]  
(b) Construct the truth table to show when Harry is tired.  
[4]  
 A professor notices that students are generally very tired and decides to investigate the   
relationship of tiredness with Work, Hunger and Sun.  
 Consider the following truth table which shows the conditions for Tired based on Work,   
Hunger and Sun.  
WHST  
0000  
0010  
0101  
0110  
1000  
1010  
1101  
1111  
(This question continues on the following page)  
  
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Turn over  
M14/4/COMSC/SP1/ENG/TZ0/XX  
(Question 12 continued)  
 The conditions for one of the students to be tired can be expressed in the following array,   
TIRED, where the index is equivalent to the combination of W, H and S in the truth table.  
[0][1][2][3][4][5][6][7]  
00100011  
TIRED  
(c) Identify a relationship between the value of S and the index of the array TIRED.  
[1]  
(d) Construct an algorithm,   
TEST, in pseudocode, to output the conditions W, H and S from   
the array TIRED for a student who is tired.  
[4]  
A collection,  
 STUDENT, is used to hold the name and the array TIRED for each student.  
(e) Outline the way in which your algorithm could be used to output the names of all those   
students who are tired due to Work and Hunger.  
[3]

3)   
 Construct, in pseudocode, the procedure salesCalculate(). [7]

4)   
   
  
 A new higher level programming language is being developed.  
(a) Identify two reasons why consistent grammar and syntax should be essential features   
of a higher level programming language. [2]  
(b) Identify two features of a user interface that will allow application programmers to   
interact more easily with the programming language. [2]  
(c) State one method of providing user documentation. [1]  
Application programmers who use this programming language will be able to choose to use   
either an interpreter or a compiler.  
(d) (i) Outline the need for an interpreter or a compiler. [2]  
(ii) Describe one advantage to application programmers of having both an   
interpreter and a compiler available. [2]  
One of the predefined sub-programs in the new language is  
sumOdd(). It accepts an integer   
N as input. If N<=0 it outputs -1, otherwise it outputs the sum of the first N odd numbers.   
For example:  
sumOdd(4) outputs 16, because 4 is not less than 0, and 1 + 3 + 5 + 7 = 16.  
sumOdd(−3) outputs −1, because −3 is less than 0.  
(e) Construct, in pseudocode, the algorithm for sumOdd(). [4]  
(f) Outline the need for predefined sub-programs and collections. [2]

5)   
   
  
 (a) Outline the need for higher level languages. [2]  
(b) Explain two benefits of using sub-procedures within a computer program. [4]  
(c) Identify three characteristics of a collection. [3]  
Collection NUMBERS already exists and stores real numbers.  
(d) Construct in pseudocode an algorithm, using the access methods of a collection, which   
will iterate through the collection NUMBERS and count how many elements stored in the   
collection are in the interval [–1,1].   
The final answer should be output. [6]  
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6)   
   
  
Consider the following algorithm.  
begin  
K = 3  
P = 1  
K>1  
output K  
output P  
end  
Ye sNo  
KK1= −  
PPK= ×  
 Trace the algorithm and show the outputs that will be produced.  
[3]

7)   
   
  
 Trace the following algorithmic fragment for   
N = 6. Show all working in a trace table.  
 SUM = 0  
 loop COUNT from 1 to (N div 2)  
 if N mod COUNT = 0 then   
 SUM = SUM + COUNT  
 end if  
 end loop  
 if SUM = N then   
 output "perfect"   
 else   
 output "not perfect"  
 end if   
[4]

8)   
   
  
 Other than the use of different keywords, outline two ways in which two higher level   
languages might differ from one another.[4]  
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Turn over   
Section B  
Answer all questions.

9)   
   
  
 In an 8-bit register, state the binary representation of the hexadecimal number 3B. [2]  
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Turn over

10)   
 Construct the pseudocode that will search the stack for a specific name, and output its position in the stack. You may assume that all names in the stack are unique. [5]

11)   
   
  
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• Work (W)  
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• Sun (S).  
   
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• he works and he is hungry  
• he works and it is not sunny  
• he does not work and is not hungry.  
(a) Represent, as a single logical expression, the conditions that cause Harry to be tired.[3]  
(b) Construct the truth table to show when Harry is tired.  
[4]  
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0101  
0110  
1000  
1010  
1101  
1111  
(This question continues on the following page)  
  
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Turn over  
M14/4/COMSC/SP1/ENG/TZ0/XX  
(Question 12 continued)  
 The conditions for one of the students to be tired can be expressed in the following array,   
TIRED, where the index is equivalent to the combination of W, H and S in the truth table.  
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00100011  
TIRED  
(c) Identify a relationship between the value of S and the index of the array TIRED.  
[1]  
(d) Construct an algorithm,   
TEST, in pseudocode, to output the conditions W, H and S from   
the array TIRED for a student who is tired.  
[4]  
A collection,  
 STUDENT, is used to hold the name and the array TIRED for each student.  
(e) Outline the way in which your algorithm could be used to output the names of all those   
students who are tired due to Work and Hunger.  
[3]

12)   
   
  
 Consider the following recursive method, where N is a positive integer   
 mystery(N)  
 if (N > 0) AND (N mod 2 = 0) then  
mystery(N−2)  
 end if  
 output N  
 end mystery  
 (a) Determine the output produced by the method call mystery(5).[1]  
 (b) Determine the output produced by the method call mystery(4).[3]  
 (c) Construct an iterative algorithm for the method mystery(), which uses a single   
while loop instead of recursion.[4]  
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