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Rajarata University of Sri Lanka

Faculty of Applied Sciences

B.Sc.(Information Communication Technology) Degree
First Year Semester I Examination –May/June 2016
Principles of Program Design and Programming – ICT1402

(Theory)

Answer any **five (05)** questions
Time allowed: **Three hours**
Use **C language** where necessary

1) i. Discuss the importance of dedicating more time for designing algorithm before coding a program. (04)
ii. List down the main program constructs in program design. (03)
iii. What is a state of an algorithm? Explain using an example. (04)
iv. Design a step form algorithm to count the multiple of seven's in a given list of **n** numbers. (05)
v. If the given list is 5, 7, 8, 4, 14, 10, 21, 35, and 40, draw a trace table to study the behavior of your algorithm in iv. above. (04)

2) i. Illustrate **for** loop and **do.. while** loop using flowcharts. (04)
ii. Design a pseudo code algorithm to find the sum of digits of a given integer. The sum can be obtained by repeatedly dividing the number by 10 and adding the remainders, until the number become zero. (06)
iii. Express the above algorithm using a flowchart. (04)
iv. Write a C function to implement above algorithm (06)

3) i. Correct the errors in following C program (05)

```
Include "stdio.ch"
int main(argc, argv)
{
      INT p,q,r,s,t;
      Float f,t;
      printf("Enter four integers")
      scanf("%i,%i,%i,%i", p,q,r,s)
      if(p>q OR r>s)
            t=p, p=q, q=t;
            t=r, r=s, s=t;
      for (t==p, p>=q, p++)
            printf("p, q, r, s", p, q, r*p, s*q)
            q++,r++,s++;
}
```


ii. Compare and contrast global and local variables. (02)
iii. Explain situations where you can use a **while loop.** What precautions you should take when using a while loop? (04)
iv. In a Caesar shift code, each letter in a message is shifted **n** places later in the alphabet. (with Z wrapping around to A). For example, if n = 1, the word **progam** becomes **qsphbn**. If n = 2, it becomes **rtqico**. Write a function called **caesar_ciper()** that takes two parameters, a word to encode and the number of places to shift, and returns the

shifted text. Assume the first parameter is a single word with no spaces or other punctuation. You may also assume it is all lowercase.
Hint: in C a single character can be treated as an integer and each character has its own ordinal value; 'a' =97,'b'=98,..., 'z'=122 (09)

4) i. What is the scope of a variable? Explain using examples. (03)
ii. Compare and contrast static variables in a function and parameters passed by reference to a function. (04)
iii. What is recursion? Discuss the advantages and disadvantages of using recursion. (04)
iv. Write a recursive function to calculate nth term of following recurrence relation; H(n)=2H(n-1) +1 for n>1, H(1)=1 (05)
v. Rewrite above function using **for loop** (04)

5) i. Define what a structure in C is, and discuss the advantages of using structures. (04)
ii. A bank maintains three types of accounts named savings, current, and child savings. Along with each individual account, the bank keeps record of account number, customer name, account type, available balance, interest rate, customer's date of birth, and opening date.
   a. Design a C structure to keep account data with appropriate data types (05)
   b. Write a function to read and return account data (05)
   c. If a customer has two accounts of same type, he/she can make a request to merge them. When merging two accounts, a new account is created using all the personal details, with a new account number, and the new balance adding two balances. Write a function to create new account by merging two accounts. (06)

6) i. What are the pitfalls in using macros in C? Discuss how to overcome those using examples. (03)
ii. Write a parameterized macro to find the smaller of given two numbers. (04)
iii. What are the four steps of processing a file in C? (04)
iv. Explain the usage of following functions in C with suitable examples.
   a. getc()
   b. ftell()
   c. fseek()
   d. fwrite() (05)
   e. feof() (04)
v. Write a program to copy a text file (a.txt) into a new text file (new_a.txt).