

B. Architecture 3<sup>rd</sup> Year 1<sup>st</sup> Semester Examination 2017

Computer Programming for Architects

Time: 3 Hours

Full Marks: 100

Attempt for 100 marks. Answer as briefly as possible.

1. a. Define a function from an algebraic or set theoretic point of view.
- b. Illustrate the schematic structure of a C program.
- c. Illustrate the schematic structure of a custom defined function in C.
- d. Very briefly explain the two types of parameter passing available in C.
- e. Show the basic pointer operations in C.

5 x 5 = 25

2. a. Explain the asymptotic complexity of an algorithm.
- b. Arrange the following functions in increasing order of growth:  $f(n) = n^2$ ,  $n \log n$ ,  $n$ ,  $\log n$ ,  $c^n$ ,  $n!$  for  $n, c \gg 0$ .
- c. Give the average and worst case time complexities for the following algorithms. Pick your function arguments from variables already in use in the code.

<pre> } while (num &gt;= 1) { rem = num % 10; rev = rev * 10 + rem; num = num / 10; } </pre>	<pre> // for ( c = 0 ; c &lt; n ; c++ ) { if ( c &lt;= 1 )     next = c; else     { next = first + second; first = second; second = next; } } </pre>	<pre> // while(b&gt;0) { temp=a; a=b; b=temp%b; } </pre>
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5 + 5 + (5 x 3) = 25

3. Write a program in C (WAP) to find the set/s of the five closest numbers in a sequence of 100 unique numbers arranged in an ascending order. Interpret this closeness in any way you want. Here is an example of expected output for a sample of 10 numbers:

```

{ 1, 3, 5, 10, 14, 16, 18, 27, 32, 50 }
1 3 5 10 14 16 18 27 32 50
{ 5, 10, 14, 16, 18 }

```

25

4. WAP to generate approximations  $n/q$  of fraction  $y/z$ ,  $n = 0, 1, 2, \dots, y$ ,  $q \geq n$  to find corresponding minimum errors  $e$  using the following algorithm and list all local maxima for custom range  $q1$  to  $q2$  for a given  $n$ .

```

for n = 0 to y
{
q1 ← | (z x n) / y + .5 |
q2 ← | (z x n) / y |
en1 ← y/z - n/q1
en2 ← y/z - n/q2
e1 ← | en1 |
e2 ← | en2 |
er1 ← e1 / (n/q1)
er2 ← e2 / (n/q2)
if er1 < er2

```

signed error.

error magnitude

relative error from the perspective of generated no. for  $n \neq 0$

selecting minimum of two errors

```

    {
    q ← q1
    er ← er1
    en ← en1
    e ← e1
    }
else
    {
    q ← q2
    er ← er2
    en ← en2
    e ← e2
    }
}

```

25

5. xvi and xvii carry 5 marks each.
- i. What does a C macro do?
  - ii. State a difference between K&R C and ANSI C?
  - iii. What is the current standard which replaces C99 called?
  - iv. Name a programming language written after 2000.
  - v. What is an IDE?
  - vi. Name two low level features of C.
  - vii. What is a global variable?
  - viii. The *printf ( )* function prints to the console. What does *fprintf ( )* print to?
  - ix. Write the command line to print the character \ in C?
  - x. Mention a function for generating random numbers in C.
  - xi. What is the base value of array index in C?
  - xii. C does not have an explicit string data type. What can they be saved as?
  - xiii. How would you create an infinite loop using *for ( )*?
  - xiv. Give an example where there is an output difference between *while ( ) do { }* and *do { } while ( )*.
  - xv. Is it possible to return two parameters from a single function in C?
  - xvi. Mention two functions from each of the following C libraries: *<stdio.h>*, *<math.h>*, *<stdlib.h>*, *<conio.h>* and *<string.h>*.
  - xvii. Provide schematic diagrams to explain five data structure supported in C.

(1 x 15) + (5 x 2) = 25