King Fahd University of Petroleum and Minerals
College of Computer Sciences and Engineering
Department of Computer Engineering

COE 301 – Computer Organization (T161)
ICS 233 – Computer Architecture & Assembly Language (T161)

Programming Assignment # 03 (*due date & time: Sunday 04/12/2016 in class*)

Matrix-vector multiplication can be described by the following function:

```
float* MVM (int n, float A[n][n], float X[n]) {
  float* V = new float[n];              // allocate an array of n floats
  int i, j;
  for (i=0; i<n; i++) {
    float sum = 0;
    for (j=0; j<n; j++) { sum = sum + A[i][j] * X[j]; }
    V[i] = sum;
  }
  return V;                             // return a pointer to vector V
}
```

In addition, you need the following support functions:

```
float* read_vector (int n) {
  // allocate a vector of n floats
  // ask the user to input n floats and read them into allocated vector
  // return address of vector
}
float* read_matrix (int n) {
  // allocate a matrix of n*n floats
  // ask the user to input n*n floats and read them into allocated matrix
  // return address of matrix
}
void print_vector (int n, float V[n]) {
  // Display the n elements of vector V
}
```

Translate the above functions into MIPS code. Write a **`main`** function that asks the user to input **`n`**. Call functions **`read_matrix`** and **`read_vector`** from **`main`** to read a matrix and a vector. Call function **`MVM`** to do matrix-vector multiplication. Then call **`print_vector`** to print the result vector. Your MIPS program should be well written and documented.

Submit through email a soft copy of your solution in a zip file with the subject line "COE301/ICS233-Prog03-yourID" to both marwan@kfupm.edu.sa and s201375910@kfupm.edu.sa. Your solution should be submitted in a **word file** that contains the following items:

(a) Your name and ID

(b) Assignment number

(c) Problem statement

(d) Your results along with the code

In addition, submit a hard copy of the word file during the class time on the due date.

Copying programming assignment is not allowed. This work should be done individually. Detected copies will get zero grades. This includes the one who wrote the program and the one who copied it.