B.E Production Engg. Examination 2017
(1st Year 2nd Semester)
Computer Programming and Numerical Analysis

Time: 3 hours   Full Marks: 100

Answer any *five* questions

1(a) An integer is called a *palindrome* if it remains same after reversal. For example, 53235, 1001, 10201, 9, 11 are palindromes whereas 53253, 1010, 10210, 10 are not palindromes. Write a C program to check if an integer supplied as input is a palindrome.

(b) Write a C program to read the values of the coefficients of a quadratic equation of the form $ax^2+bx+c=0$ and display the values of its roots. Also, arrange to display the real part and the imaginary part of the complex conjugate roots separately if the discriminant becomes less than zero.

10+10

2 (a) Binary search is applied to find a given number x in an array of numbers. If x can be found in the array its relative position of occurrence is displayed else a message 'Not found' is displayed. When binary search is applied it is assumed that the array of numbers is already arranged in ascending order of their values, i.e., arranged from lowest to highest. Binary search begins by comparing x with the middle element of the array.

Step:

 1. If the middle element matches with x then search terminates successfully.

2. If x is found greater than the middle element then x is compared with the middle element of the *upper half* of the array, which starts from the element immediately next to the previous middle element.

3. . If x is found less than the middle element then x is compared with the middle element of the *lower half* of the array, which ends with the element immediately preceding the previous middle element.

4. The above steps of operation are continued until x can be matched with an array element in step 2 or step 3 or no more elements can be found there to match with x ending the search unsuccessfully. (in the latter case, the value of the lower bound of the array-half where x is searched crosses the value of the upper bound of the same half.)

Write a C program to implement *binary search* as described here.

(b) Write a C program to read the elements of two matrices a(mxn) and b(nxp) in two arrays, and store the product of a and b in another array c (mxp) Assume that the value of m, n or p can be at most 10. Also assume that all the elements of the matrices are integers.

10+10

[Turn over

3(a) Write a user defined function in C to convert a given degree Centigrade temperature value (c) in an equivalent Fahrenheit temperature (f) using the formula f=1.8c+32. Using the function, write a complete C program to read n number of experimentally sampled degree Centigrade temperature values as input and display the equivalent Fahrenheit temperatures in a tabular form. That is, in the table displayed as output, the first column will have a heading 'Centigrade' and the second column 'Fahrenheit' and the temperature values will be printed under proper columns. The value of n will also be supplied as input at the beginning .

(b) Write a C program to read an English sentence as input and display the number of occurrences of each vowel in the sentence in a tabular form. The number of occurrences of other non vowel alphabet , spaces and punctuations, if any in the sentence, grouped as 'other characters' should also be printed. Use switch-case statement for the program.

10+10

4(a) Apply Gauss-Jordan Elimination to solve the following:

$x_0+2x_1+3x_2=-7$

$2x_0-3x_1-5x_2=9$

$-6x_0-8x_1+x_2=-22$

(b) Assuming that the augmented coefficient matrix of some simultaneous n linear equations with n unknowns is stored in a two dimensional array **a** of data type float and the values of n unknowns in a one dimensional array **X** of the same data type, write only the effective portion of C code necessary for diagonalization of the matrix as done for Gauss-Jordan Elimination. Pivoting need not be incorporated in the code. You can use integer type variables **i, j, k** and an additional float type variable **C**, if needed, for writing the code.

10+10

5(a) The speed of a moving body in m./sec. is given below

t (sec.)	0	2	4	6	8	10	12
v (m./sec)	4	6	16	34	60	94	136

Find the distance traversed by the moving body in 12 sec., using (i) Trapezoidal rule, (ii) Simpson's $1/3^{rd}$ rule. Explain the difference, if any, in the results in two cases.

(b) Derive the formula for modified Euler's method for numerical solution of first order differential equations. Apply the method to estimate y(0.02) from the following

$$\frac{dy}{dx} = x+y+xy$$

y(0)=1
Take h=0.01

10+10

6(a) Derive the condition for convergence of Newton-Raphson's method. Apply Newton-Raphson's method to solve $e^{(x-3)}=-x+2$. The solution needs to be correct up to 3 decimal places.

(b) Define Eigen values and Eigen vectors of a square matrix. Discuss about Power method to find the largest Eigen value.

12+8