M.Sc. 1st Semester Examination, 2019

MATHEMATICS

(Advanced Programming in C and MATLAB)

PAPER —MTM-104

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. Answer any *four* questions :   2 × 4

   (*i*) Write a program in MATLAB to count the number of elements in a list which are greater than a threshold value not using any loop.

(*ii*) Write a program in MATLAB to show that three vectors are parallel.

(*iii*) An array M is a $n-by-2$ dimensional array where the first column stores the roll numbers of the students and the second column stores their percentage marks. Write a program in MATLAB to find the roll numbers of all students who have more than a particular mark.

(*iv*) Given four matrices A, B, C and D of order $m \times n$. Write a program in MATLAB to find a matrix E of order $m \times n$ in such a way that $E_{ij} = C_{ij}$ if $A_{ij} > B_{ij}$, otherwise $E_{ij} = D_{ij}$ not using any loop.

(*v*) Write down the differences between structure and union in C.

(*vi*) What do you mean by void pointer in C ? Explain with example.

(*vii*) What is the output with reasons of the following program

```
void main()
{
    int a[] = {0, 1, 2, 3, 4};
    int*p[] = {a, a + 1, a + 2, a + 3, a + 4};
    int **ptr = p;
    printf ("%d %d\n", a, *a);
    printf ("%d %d %d\n", p, *p, **p);
    printf ("%d %d %d\n", ptr, *ptr, **ptr);
}
```

(*viii*)How strings are stored in the memory ? Explain with example.

2. Answer any *four* questions : 4 × 4

(*i*) The exponential power of x is approximated by the following infinite series

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots\cdots$$

Write a program in MATLAB to find out how many terms will be sufficient in the right-hand side of the given expression to ensure that the result is within the 5% error of the exact value.

(*ii*) Write a function to draw a curve of function passing the name of the function and domain through input statements entering more functions until a student quits by typing an '!' character.

(*iii*) Explain the utilities of 'inline', 'eval' and 'feval' functions.

(*iv*) Explain the relational and logical operations in MATLAB with examples.

(*v*) Write a program in C to convert the content of a text file to uppercase.

(*vi*) Explain different types of bitwise operators in C.

(*vii*) Write a program in C to find the product of two complex numbers defining a complex number using structure.

(*viii*) What is a macro ? Summarize the similarities and dissimilarities between macros and function. How is a multiline macro defined ?

3. Answer any *two* questions : 8 × 2

   (*i*) Write down two functions in C to determine largest and smallest elements from a list of numbers, then invoke one of these through the pointer to the function by an another function which is called from the main function by which the list of numbers is sent as an argument of the function.

2 + 2 + 2 + 2

   (*ii*) Write down a function in C for sorting some strings, then use it to display the sorted strings using dynamic memory allocation in the main function. 4 + 4

   (*iii*) Write down a program in C to count the number of vowels, consonants and space in a line by checking these characters with a user defined function with return type 'enumeration'. 4 + 4

   (*iv*) What is cell array in MATLAB ? How a cell array can be created ? Illustrate with examples. What is structure in MATLAB ?

Discuss the ways to create s structure with examples. How can a cell array be converted into structure and vice versa ? 8

[*Internal Assessment* : 10 Marks]

———————