M.Sc.(Instrumentation) Examination 2017
(1st year 1st semester)
Subject: Numerical Methods and Programming in C

Full Marks: 100   Time-4 hrs

PAPER-II(T- 102)
GROUP-A

Answer any four questions (each question carries equal mark)

1.(a) Round off the following numbers upto the four decimal places.
      (i) 65.732550   (ii) 1.235650   (iii) 114.2356501
  (b) Find the absolute error, relative error and percentage error in $f(x) = 3 \sin x - 2 x^2 - 9$ for
     $x = 0$ if error in x is 0.003.

  (c) Examine whether 94.56556 in correctly rounded off form of the number 94.56556501
     upto the five decimal places.   (4+6+2½)

2.(a) Solve any one equation for the least positive real root correct upto three decimal places
     by the bisection method.
      (i) $x^3 + 3x - 5 = 0$ (ii) $- \cos x + xe^x = 0$

  (b) From the following table calculate f(0.16) by Newton's forward interpolation formula,

x :	0.1	0.2	0.3	0.4
f(x) :	1.005	1.020	1.045	1.081

Also calculate f(0.35) by Newton's backward interpolation formula.   (6+6½)

3.(a) State Lagrange's interpolation formula and discuss its advantages. Determine the value
     of sin л/5 by Lagrange's interpolation formula using the following set of values.

x :	0	л/6	л/4	л/3	л/2
Sin x :	0	0.50	0.7071	0.866	1

  (b) Fit the straight line $y = a + bx$ to the following points by the principle of least squares:

    (3, 4), (4, 2),   (5, 4),   (6, 3), (7, 5), (7, 3), (8, 4) and (9, 2).   (6+6½)

4.(a) Find the general term of the series whose first four terms are 3, 16, 51 and 120, and
     hence find its 5th and 6th terms.

  (b) Solve the following system of equations upto the third iterations by Gauss' -- Seidel
     method.
$$10x + 2y + z = 9$$
$$x + 10y - z = -22$$
$$-2x + 3y + 10z = 22$$
                                       (6+6½)

5. (a) Compute $\int_0^1 \sqrt{\tan x}\, dx$ by Sympson's 1/3 rd rule taking h = 0.2.

  (b) Solve $\frac{dy}{dx} = x + y$, if y (0) = 1, h = 0.1 and x ε [0, 1] by Runge – kutta method upto
     the third iteration y(0.3).   (6+6½)

6.(a) Solve $\frac{dy}{dx} = xy$ by Tailor's series method of order four taking h = 0.1, and y(0) = 1
     and x ε [0, 1]; upto y (0.3).
  (b) Evaluate $\int_0^4 \sin 2\sqrt{x} / \sqrt{x}\, dx$ by any method   (8+4½)

Group-B

1. Answer all the questions:
   (1×10)=10
   Choose the correct options for the following problems:-

   i. What is (void*)0?
      a. Representation of NULL pointer
      b. Representation of void pointer
      c. Error
      d. None of above

   ii. Point out the compile time error of the C Program written below:

   ```
   #include<stdio.h>
   #include<conio.h>
   int main()
   {
   int *x;
   *x=100;
   return 0;
   getch();
   }
   ```

   a. Error: invalid assignment for x
   b. Error: suspicious pointer conversion
   c. No error
   d. None of above

   iii. Which state is correct about the program written below?

   ```
   #include<stdio.h>
   #include<conio.h>
   int main()
   {
   int i=10;
   int *j = &i;
   return 0;
   getch();
   }
   ```

   a. j and i are pointers to an int
   b. i is a pointer to an int and stores address of j
   c. j is a pointer to an int and stores address of i
   d. j is a pointer to a pointer to an int and stores address of i
   e.

   iv. Input/output function prototypes and macros are defined in which header file?
      a. conio.h
      b. stdlib.h
      c. stdio.h
      d. dos.h

   v. The keyword used to transfer control from a function back to the calling function is _____
      a. switch
      b. goto
      c. go back
      d. return

vi.   Are the expressions arr and &arr same for an array of 10 integers?
   a. Yes
   b. No

vii.   If the two strings are identical, then strcmp() function returns _____
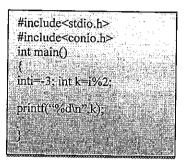   a. -1
   b. 1
   c. 0
   d. Yes

viii. How will you print \n on the screen?
   a. printf("\n");
   b. echo "\\n";
   c. printf('\n');
   d. printf("\\n");

ix.   What is the output of this C code?

```
#include<stdio.h>
#include<conio.h>
int main()
{
inti=-3; int k=i%2;

printf("%d\n",k);

}
```

   a. Compile time error
   b. -1
   c. 1
   d. Implementation defined

x.   What is the output of this C code?

```
#include<stdio.h>
#include<conio.h>
int main()
{
inti=0;

int x=i++; int y=++i;

printf("%d %d\n",x,y);

}
```

   a. 0, 2
   b. 0,1
   c. 1, 2
   d. Undefined

2. Answer any 5 questions: (3×5)=15
   a. Write down a C program to print the following pattern:

   55555
   4444
   333
   22
   1

   b. Write down a C program to swap two numbers using the concept of 'Call by Reference'.
   c. Write a short note on different types of operators used in C.
   d. Write down a C program to print a Fibonacci series.
   e. Write down a C program to print all the odd numbers between 1 & 100.
   f. Write down a C program to find out factorial of a number (given by user) using the concept of recursion.
   g. Write down a C program to print reverse of a number (given by user).

3. Answer any 3 questions: (5×3)=15
   a. Writedown a C-program to evaluate the following integral using Simpson 1/3-rule:

   $$\int_{-1}^{1}(x+e^x\tan^2 x)dx$$

   b. Write down a C-program to find the sum of a Cosine series, Cos θ, where θ is given in degree.
   c. Write downa C-program to find the root of the equation $x^2 - x\exp(x) - 0.1 = 0$ using Newton-Raphson method with initial assumption $x=1.1$.
   d. Write downa C-program to find the value of y(1) using Euler's method from the following differential equation:

   $$\frac{dy}{dx}=\frac{y-x}{y+x}, \quad y(0)=1.$$

   e. Write downa C-program to find the value of y(1) using fourth order Runge-Kutta method from the following differential equation:

   $$\frac{dy}{dx}=x^2-y, \quad y(0)=1.$$

4. Answer any 2 questions: (5×2)=10
   a. Write down a C program to add two 2×3 matrices.
   b. Write down a C program to check whether a string is palindrome or not.
   c. Write down a C program to add two complex numbers using the concept of structure.
   d. ˙Write down a C program to (i) open a file, (ii) writing to the file &(iii) close the file.