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Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, July 2019

Branch : Mathematics

MM 224 – SCIENTIFIC PROGRAMMING WITH PYTHON

(2017 Admission onwards)

Time : 3 Hours Max. Marks : 50

Answer either part A or part B of each question.

All question carry equal marks.

1. (A) (a) What are the different loop control statements available in Python? Explain with suitable examples. **5**

(b) Explain about different Logical operators in python with appropriate examples. **5**

(B) (a) Explain about Arithmetic operators in python with appropriate examples. **5**

(b) What are the different operations that can be performed on a list? Explain with examples. **5**

2. (A) (a) Write a short note on "Matplotlib" package. **5**

(b) Explain the following functions with suitable examples.

P.T.O.

(i) show( )

(ii) plot( )

(iii) range( )

(iv) legend( )

(v) title( ) 5

(B) (a) Write a note on "pyplot" module. 5

(b) Write a program that prints the value of $y = x^2 + x + 1$ for $x = 0,2,4,6,8,10$. Using this generated values of x write a program to plot the points (x, y). 5

3. (A) (a) Write a note on "sympy" module. 4

(b) Explain how to plot $y = x + 1$ using "sympy" module. 6

(B) (a) Write a program to compute the length of the curve $y = x^2$ from $x = -5$ to $x = 5$. 5

(b) Write a program to print the first 100 Fibonacci numbers 5

4. (A) (a) Use Doolittle's decomposition method to solve $Ax = b$, where 5

$$A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{pmatrix}, b = \begin{pmatrix} 5 \\ 6 \\ 8 \end{pmatrix}$$

(b) Use Newton's method to find a root of the equation $x^3 - 3x - 5 = 0$. 5

(B) (a) Find the interpolating polynomial for the function $f(x)$ given by **5**

x	0	1	2	5
$y = f(x)$	2	3	12	147

(b) Solve $x^3 - 9x + 1 = 0$ for the root between $x = 2$ and $x = 4$ by the bisection method. **5**

5. (A) (a) Derive Simpson's 3/8 rule from Newton's Cotes formula. **5**

(b) Evaluate the integral $\int_1^5 \frac{1}{1+x^2} dx$ using (i) trapezoidal rule and (ii) Simpson's rule 1/3 rule, taking $h = 0.25$. **5**

(B) (a) Solve the following initial value problem $y' = x + y, y(0) = 1$, using fourth order Runge Kutta method from $x = 0$ to $x = 0.4$ taking $h = 0.2$. **5**

(b) Solve the initial value problem $y' = x^2 + y^2, y(0) = 0.5$ from $x = 0.1$ to 0.2 using $h = 0.1$. **5**