Numerical Methods -Assignment #2
Engineering Mathematics for Advanced Studies
IIT Dharwad
Autumn 2019

Submission - Thursday 15th Nov. 2019 5:30pm
Total score - 10 marks
Late penalty - 1 day late* 30%, 100% for more than a day (*starts from 5:31pm, 15th Nov. 2019!)

1. Derive expression for error in Simpsons' integration method. (You may refer to the prescribed text where it could be readily available) (2 marks)

2. Fill in the table below given that the grid spacing value (increment) is h (2 marks)

Operation	Method	Order of Error
Integration	Trapezoidal	
	Rectangular	
	Simpsons	
	Gaussian Quadrature	
Differentiation	First order Forward Difference	
	First order Backward Difference	
	First order central Difference	
	Second order Forward Difference	
	Second order Backward Difference	
	Second order central Difference	

3. Compare Newton-Raphson Method to Secant method -

   (a) which one entails entails more number of evaluations of a function value for a given x_n (1 mark)

   (b) which one is suitable for use in higher dimensional problem (1 mark)

4. Express following differential equations as a system of first order differential equations (2 marks)

$$\frac{d^4y}{dx^4} - 3\frac{d^2y}{dx^2} + y = 0$$

5. Regarding Parabolic PDE and Hyperbolic PDE, please read the text from the textbook.

   (a) While applying finite difference method to parabolic equations, what is the criterion for stability of the scheme? (1 mark)

   (b) Draw stencil for the Crank-Nicolson scheme and state advantage of Crank-Nicolson scheme against finite difference approximation of the parabolic PDE equation? (1 mark)