NUMERICAL ANALYSIS

Assignment - 4 (week 4)

Total Marks - 25

Posted on - 14/8/2017 (Monday);

To be submitted on or before-23/8/2017 (Wednesday), 23.59 hours.

Problems on

- Trapezoidal Rule
- Simpson's Rule
- Method of undetermined coefficients
- Gauss quadrature Two-point Method

INSTRUCTIONS

- This is a question paper cum answer booklet.
- Take a print out of this.
- Present the details of the computations of the solution of each problem **which you will have to show** in the space provided at the bottom of the page.
- Fill in the answers in the space provided below each question.
- Scan the booklet and submit it as a pdf file before the deadline for evaluation.

1. Approximate the intgral $I = \int_e^{e+1} \frac{dx}{xlnx}$ using the Trapezoidal rule and fill in the blank:
$I = \int_e^{e+1} \frac{dx}{xlnx} \simeq$ _____ . (2 marks)

Show your work for the solution of problem 1 in the space provided below.

2. Choose the correct answer.
The Trapezoidal rule applied to $\int_0^2 f(x)dx$ gives the value 4 and the Simpson's rule gives the value 2.
Then $f(1) =$ _____. (3 marks)

Show your work for the solution of problem 2 in the space provided below.

3. Estimate $\int_0^\pi x^2 cosxdx$ using 6 subintervals with composite Simpson's rule and fill in the blank: $\int_0^\pi x^2 cosxdx \simeq$ _____ . (4 marks)

Show your work for the solution of problem 3 in the space provided below.

4. In approximating the integral $\int_0^{\pi} sinxdx$ using Simpson's rule, how many subintervals are needed to ensure that the error in Simpson's rule approximation is less than 10^{-6}?
Fill in the blank:
The number 'n' of subintervals required to ensure the desired accuracy is _____ . (4 marks)

Show your work for the solution of problem 4 in the space provided below.

5. Determine the value of the step-size 'h' necessary to find an approximation to $\int_0^2 sin\ 3xdx$ to within 10^{-2} using the composite Simpson's rule and fill in the blank: the step-size 'h' required to obtain the desired accuracy is _____ . (4 marks)

Show your work for the solution of problem 5 in the space provided below.

6. Find a quadrature of the form $\int_0^1 f(x)dx \simeq A_0 f(0) + A_1 f(\frac{1}{2}) + A_2 f(1).....(*)$ that is exact for all polynomials of degree$\leq$2. What is the degree of precision of $(*)$? and fill in the blanks:

(a) $A_0 =$ _____ ; (b) $A_1 =$ _____ ;

(c) $A_2 =$ _____ ;
(d) the degree of precision of $(*)$ is _____ . (8 marks)

Show your work for the solution of problem 6 in the space provided below.