



Final Exam . Summer Semester: 2015/2016

Course Title: Engineering Analysis II
Course No:(630262)

Date: 01/09/2016
Time Allowed: 2 hours No. of Pages: 2

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Lecture Time: 8:00

9:10

11:30

Question 1: (5 marks)

Use false position method to solve the following equation starting with $x_L = 0.3$ and $x_U = 1.4$, Perform iterations until the relative error is less than 0.01

$$f(x) = \sin^3(x) - 0.4$$

Question2: (5 marks)

Perform two Gauss-Seidel iterations to approximate the solution of the following system of linear equations then calculate the absolute error in the last iteration. Start with $x = 0$, $y = 0$, $z = -2$

$$6.2x - 2y - 0.8z = 13.4$$

$$2x + 5.2y - 0.1z = -8$$

$$0.5x + 0.3y - 1.2z = 4.7$$

Question 3: (5 marks)

Use 3rd order Lagrange interpolation polynomial to approximate $f(3.1)$ for the following data:

| | | | | |
|---|---|-----|---|-----|
| x | 2 | 2.5 | 3 | 3.5 |
| y | 3 | 5 | 8 | 12 |

Question 4: (5 marks)

Use Linear Regression to find the relation $y = Ax + b$ between x and y .

| | | | | | | |
|---|-----|------|-----|-----|-----|-----|
| X | 1.3 | 1.6 | 1.9 | 2.3 | 2.5 | 2.7 |
| Y | 0.4 | 1.75 | 3 | 4.5 | 5.6 | 6.4 |

Question 5: (5 marks)

a) Approximate the following integral using composite trapezoidal rule with 7 sampling points

$$\int_{0.5}^{1.4} x^2 e^x dx$$

b) Find the relative error if the true solution is $x^2 e^x - 2x e^x + 2e^x$

Question 6: (5 marks)

Use 2RK (Huen's) method to approximate $y(2.4)$ for the following differential equation with step size=0.2:

$$2ydy = (x^2 + 1)dx \quad y(2) = 3$$

If the exact solution of this differential equation is $y = \sqrt{\frac{1}{3}x^3 + x + \frac{13}{3}}$ find relative error.

Question 7: (10 marks) "one mark each"

| | | | | | | | | | | | |
|--|--|--|--|-----|---|---|---|--------|---|---|---|
| 1- If $x_i = 3.531$ and the absolute error at x_i $E_{abs}=0.00133$ then x_i is correct to _____ significant digits: | | | | | | | | | | | |
| A). 1 | B). 2 | C). 3 | D). 4 | | | | | | | | |
| 2- If $x_u=4$ and $x_l=2.5$ then the absolute error after performing 3 bisection iteration is: | | | | | | | | | | | |
| A). 0.09375 | B). 0.1875 | C). 0.375 | D). 0.75 | | | | | | | | |
| 3- The Eigen values of $A = \begin{bmatrix} 3 & 4 \\ 2 & 5 \end{bmatrix}$ are: | | | | | | | | | | | |
| A). $\lambda_1=1 \quad \lambda_2=7$ | B). $\lambda_1=-1 \quad \lambda_2=7$ | C). $\lambda_1=1 \quad \lambda_2=-7$ | D). $\lambda_1=-1 \quad \lambda_2=-7$ | | | | | | | | |
| 4- The inverse of $A = \begin{bmatrix} 0.1 & 0.3 \\ 0.1 & 0.6 \end{bmatrix}$ is | | | | | | | | | | | |
| A). $\begin{bmatrix} 20 & -10 \\ -3.333 & 3.333 \end{bmatrix}$ | B). $\begin{bmatrix} 20 & 10 \\ 3.333 & 3.333 \end{bmatrix}$ | C). $\begin{bmatrix} 3.333 & -10 \\ -3.333 & 20 \end{bmatrix}$ | D). $\begin{bmatrix} 3.333 & 10 \\ 3.333 & 20 \end{bmatrix}$ | | | | | | | | |
| 5- Using simple simpson's rule to integrate $\int_2^4 (3 - 2x)dx$ the result will be: | | | | | | | | | | | |
| A). -3 | B). -4 | C). -5 | D). -6 | | | | | | | | |
| 6- The value of $f(5)$ by using 2 nd order newton interpolation polynomial for the following data is: | | | | | | | | | | | |
| <table border="1"> <tr> <td>x</td> <td>3</td> <td>4</td> <td>6</td> </tr> <tr> <td>$F(x)$</td> <td>2</td> <td>4</td> <td>8</td> </tr> </table> | | | | x | 3 | 4 | 6 | $F(x)$ | 2 | 4 | 8 |
| x | 3 | 4 | 6 | | | | | | | | |
| $F(x)$ | 2 | 4 | 8 | | | | | | | | |
| A). 6 | B). 5 | C). 4 | D). 3 | | | | | | | | |
| 7- If $f(x) = x^2 + 4x + 4$ then x_{i+1} can be simplified using Newton-Raphson method as: | | | | | | | | | | | |
| A). $x_{i+1} = \frac{x_i}{2} + 1$ | B). $x_{i+1} = \frac{x_i}{2} - 1$ | | | | | | | | | | |
| C). $x_{i+1} = \frac{x_i}{2} + 2$ | D). $x_{i+1} = \frac{x_i}{2} - 2$ | | | | | | | | | | |
| 8- In non Linear regression for function $y=Ce^{Dx}$ if $\sum \ln(y)=35.74$, $\sum x=6.341$, $C=1.279$ and $N=5$ then the value of D is: | | | | | | | | | | | |
| A). 2.649 | B). 0.1430 | C). 4.643 | D). 5.443 | | | | | | | | |
| 9- If $\frac{dy}{dx} + \tan(x)y = \cos^2(x)$ and $y(0) = 2$ then $y(0.5)$ with step size $h=0.5$ using Euler method is: | | | | | | | | | | | |
| A). 3.5 | B). 2.5 | C). 1.5 | D). 0.5 | | | | | | | | |
| 10- Which of these statements is true: | | | | | | | | | | | |
| 1- If A is a matrix then A is invertable if $\det(A) \neq 0$. | | | | | | | | | | | |
| 2- If A and B are matrices and $A=B^T$ then $A^2=AB$ | | | | | | | | | | | |
| A). both 1 and 2 | B). 1 only | C). 2 only | D) both are wrong. | | | | | | | | |