

CSU33081 Sample Exam Paper 2020

Instructions

- There are 10 Multiple Choice Questions. Answer **ALL** questions.
- This is a 'Books-Open' exam. Use of the text(s) and notes is permitted.
- Use of non-programmable calculators is permitted.
- You may not use MATLAB or similar software for this examination.
- You must upload your typeset solutions along with the filled out Multiple Choice Questionnaire and the declaration that this is your own work to Blackboard.
- To fill out the questionnaire place the letter (A, B, C or D) denoting the correct answer after 'Answer' at the end of the question.
- **ALL** documents submitted should be as .pdfs
- You will only receive marks for a question if your answer is accompanied with a bona-fide solution as above.

Q1.

What is the displayed result when the following MATLAB script file is executed?

```
x=[6:8;-1:1;567];
```

```
y=x(:,3);
```

```
size(y')
```

Choose your answer from the following:

A. 1 1

B. 3 1

C. 1 3

D. 3 3

Answer: C

Q2.

Consider the following MATLAB program:

```
X=(5<7)&((1>4) | (8~=0))
```

What is the value of X?

Choose your answer from the following:

A. 0

B. False

C. True

D. 1

Answer:

D

Q3.

How would we represent the summation of the following two polynomials in MATLAB?

$$2x^2 + 2x - 6$$

and

$$x^3 + 2x - 4$$

Choose your answer from the following:

- A. [-6 2 2]+[-4 2 1]
- B. [2 2 -6]+[1 2 4]
- C. [0 2 2 -6]+[1 0 2 -4]
- D. [2 2 -6 0]+[1 2 4 0]

Answer: C

Q4.

Calculate the Truncation Error, $f(x) - P_2(x)$ at $x = 2.5$, in approximating the function $f(x) = 3 - 17x^3$.

For the approximation use the Taylor Series polynomial approximation of degree two, $P_2(x)$, expanded about the point $x_0 = 2.0$.

Choose your answer from the following:

- A. -7.171875
- B. -7.645227
- C. -4.358405

D. -7.994173

Answer: [None of these : -2.125](#)

Q5.

Use Newton's Method to find a root of the equation

$f(x) = x^6 - x - 1$ accurate to within an error of $\epsilon = x_n - x_{n-1} = 0.001$, where x_n is the value of x at the n^{th} iteration. Use a starting point of $x_0 = 1.5$.

Choose your answer from the following:

A. 1.134778

B. 0.616384

C. 1.505056

D. 1.160489

Answer: [A](#)

Q6.

Find the lower triangular matrix [L] in the [L][U] decomposition of the matrix given here:

$$\begin{pmatrix} 25 & 5 & 4 \\ 10 & 8 & 16 \\ 8 & 12 & 22 \end{pmatrix}$$

Choose your answer from the following:

A. $\begin{pmatrix} 1 & 0 & 0 \\ 0.4000 & 1 & 0 \\ 0.3200 & 1.7333 & 1 \end{pmatrix}$

B. $\begin{pmatrix} 25 & 5 & 4 \\ 0 & 6 & 14.400 \\ 0 & 0 & -4.2400 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 0 & 0 \\ 10 & 1 & 0 \\ 8 & 12 & 0 \end{pmatrix}$

D. $\begin{pmatrix} 1 & 0 & 0 \\ 0.4000 & 1 & 0 \\ 0.3200 & 1.5000 & 1 \end{pmatrix}$

Answer: **A**

Q.7

Using $x_1 = 1, x_2 = 3, x_3 = 5$ as an initial guess at the solution, determine the values of x_1, x_2 and x_3 that result from three iterations of the Gauss-Seidel method applied to this matrix equation:

$$\begin{pmatrix} 12 & 7 & 3 \\ 1 & 5 & 1 \\ 2 & 7 & -11 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ -5 \\ 6 \end{pmatrix}$$

Choose your answer from the following:

- A. $x_1 = -2.833, x_2 = -1.4333, x_3 = -1.9727$
- B. $x_1 = 1.4959, x_2 = -0.90464, x_3 = -0.84914$
- C. $x_1 = 0.90666, x_2 = -1.0115, x_3 = -1.0243$
- D. $x_1 = 1.2148, x_2 = -0.72060, x_3 = -0.82451$

Answer: C

Q8.

There is a functional relationship between the density ρ of air and altitude h above sea-level.

h (km)	0.32	0.64	1.28	1.60
ρ (kg/m ³)	1.15	1.10	1.05	0.95

The functional relationship has the form $\rho = k_1 e^{-k_2 h}$. k_2 is found to be $k_2 = 0.1315$. Also, the density of air at the top of the atmosphere is $1/1000^{th}$ the density of air at sea-level.

The altitude in kilometres to the top of the atmosphere is best approximated by:

Choose your answer from the following:

- A. 46.2
- B. 46.6
- C. 49.7
- D. 52.5

Answer: **D**

Q9.

For the function $f(x) = \sqrt{x}$ and the points

$x_0 = 2, x_1 = 3, x_2 = 7$ evaluate the quadratic Newton's interpolating polynomial at $x = 2.5$

Choose your answer from the following:

- A. -0.063133
- B. -0.036335
- C. -0.098334
- D. -0.017882

Answer: none ans=1.5774

Q10.

The value of $\int_{0.2}^{2.2} e^x dx$ using a two-segment (interval) Simpson's 1/3 rule is best approximated by:

Choose your answer from the following:

- A. -7.8063
- B. 7.8423
- C. 8.4433
- D. 10.246

Answer: B