The University of Nottingham Ningbo China

Centre for English Language Education

MID-SEMESTER EXAM, Spring 2022

INTRODUCTION TO MATHEMATICAL SOFTWARE & PROGRAMMING

Time allowed 60 Minutes

Candidates may complete the information required on the front page of this booklet but must NOT write anything else until the start of the examination period is announced.

This paper comprises FIFTY questions. Answer all questions.

Answers must be written in this booklet.

No calculators are permitted in this examination.

Dictionaries are not allowed with one exception.Those whose first language is not English may use a standard translation dictionary to translate between that language and English provided that neither language is the subject of this examination. Subject specific translation dictionaries are not permitted.

No electronic devices capable of storing and retrieving text, including electronic dictionaries, may be used.

Do not turn examination paper over until instructed to do so.

ADDITIONAL MATERIAL: *None.*

INFORMATION FOR INVIGILATORS:

1. *Please give a 15-minute warning before the end of the exam.*
2. *Please collect this booklet at the end of the exam.*

Student ID: _____

Seminar Group (*e.g.* A35): _____ **Marks** (out of 50): _____

You must record (tick) exactly one response for each question.
No response will be recorded as an abstain..

1. GeoGebra

1. Consider the list L={1,2,3,4,5}. What is the output of L(1+Length(L))?

   ☐ 0 ☐ 1 ☐ 6 ☑ error

2. Reconsider the list L in Question 1; what is the output of Append(0,L)?

   ☐ {1,2,3,4,5,0,0} ☐ {1,2,3,4,5,0} ☑ {0,1,2,3,4,5} ☐ NONE

3. Reconsider the list L in Question 1; suppose we want the list to become L={1,2,3,4,15}. Which of the following commands is suitable?

   ☐ SetValue(L,L+10)

   ☐ SetValue(L,Append(L,10))

   ☐ Append(L,L(Length)+10)

   ☑ SetValue(L,L(Length)+10)

4. Consider L={1,2,3,4,5,6}; what is the output of: SetValue(L,Append((L(5)+L(6),L)))?

   ☐ {1,2,3,4,5,6,11}

   ☑ {11,1,2,3,4,5,6}

   ☐ {11,1,2,3,4,5,6,11}

   ☐ {6,5,1,2,3,4,5,6}

5. Suppose that you want to create a RESET button that upon click, cleans the list L in Question 4. Which scripting command will perform this?

   ☐ clean(L) ☐ L=0 ☐ SetValue(L,L=0) ☑ SetValue(L,L={})

6. Suppose in an animation APP, you are asked to design a STOP button which is linked to a slider called S. What is the appropriate scripting command?

   ☐ SetValue(S,0)

   ☐ StopAnimation(S,true)

   ☑ StartAnimation(S,false)

   ☐ All correct

7. Suppose you have a list of points called `data={(0,0),(1,1),(2,2),···,(10,10)}`. Which of the following commands will connect all these points together?

   - ☐ `Segment(data(k),data(k+1))`
   - ☑ `Sequence(Segment(data(k),data(k+1)),k,1,10)`
   - ☐ `Segment(Sequence(data(k),data(k+1)),k,1,10)`
   - ☐ ALL correct

8. What is the output of: `Random()+RandomBetween(0,5)+0.75`?

   - ☐ A random number in the range from 1.75 to 5.75
   - ☐ A random number in the range from 0.75 to 5.75
   - ☐ A random number in the range from 0 to 5.75
   - ☑ A random number in the range from 0.75 to 6.75

9. Suppose you want to create 100 random numbers using a slider. Which of the following commands will ensure the generation of a new random number as the slider value changes?

   - ☐ `RandomBetween(0,100)`
   - ☐ `Random()*RandomBetween(0,100)`
   - ☑ `UpdateConstruction()`
   - ☐ `SetValue(Random())`

10. Suppose that you make a slider in GeoGebra with minimum value of 0, maximum of 1 and increments of 0.02. How many value points does this slider create?

    ☐ 500 ☐ 50 ☐ 49 ☑ 51

11. Which of the following scripting commands will activate a `START` button for an animation in GeoGebra?

    - ☐ `start[true]`
    - ☑ `StartAnimation[true]`
    - ☐ `StartAnimation[ ]`
    - ☐ none of the above

2. LaTeX

12. What is meant by the `preamble` in LaTeX?

- ☐ The space between `\begin{document}` and `\end{document}`
- ☐ Anything that is typed after `\begin{document}`
- ☑ The space between `\documentclass` and `\begin{document}`
- ☐ The top of the PDF file

13. Which LaTeX command will produce the largest font size?

☐ `\tiny` ☐ `\large` ☑ `\LARGE` ☐ `\Large`

14. Which LaTeX command will produce: PRIME NUMBERS are *finite*

- ☑ `\textsc{Prime Numbers} are \textit{finite}`
- ☐ `\textsc{PRIME NUMBERS} are \textit{finite}`
- ☐ `\textsc{Prime Numbers} are \finite`
- ☐ `\Prime \Numbers are \finite`

15. What is the output of: `\textbf{recursive} algorithms are \underline{sometimes} faster.`

- ☐ recursive algorithms are sometimes faster
- ☑ **recursive** algorithms are sometimes faster
- ☐ **recursive** *algorithms are* sometimes *faster*
- ☐ none of the above

16. Which of the following commands will produce: the price of butter is `5.20RMB`

- ☐ `\texttt{the price of butter is 5.20RMB}`
- ☐ `the price of butter is $5.20RMB$`
- ☑ `the price of butter is \texttt{5.20RMB}`
- ☐ `the price of butter is \5.20RMB`

17. What is the output of the following LaTeX command: `$\sqrt{\frac{y}{x+1}}$`

☐ $\sqrt{\frac{y}{x}+1}$ ☑ $\sqrt{\frac{y}{x+1}}$ ☐ $\sqrt{\frac{y}{x}}+1$ ☐ $\frac{\sqrt{y}}{x+1}$

18. Which of the following commands cannot be used in the preamble of a LaTeX document?

☐ `\parindent` ☑ `tabular` ☐ `\setlength` ☐ ALL of them

19. What **specific** environment within `eqnarray` environment do we need to use in order to display the following:

$$|x| = \begin{cases} -x & (x < 0) \\ x & (x > 0) \end{cases}$$

☑ `cases` ☐ `equation` ☐ `option` ☐ `align`

20. What is the output of the following command: `$A_{ij}=a_{i}b^{kj}$`

☐ $Aij = aibkj$ ☐ $A_ij = a_ib_kj$ ☐ $A_{ij} = a_ib^kj$ ☑ $A_{ij} = a_ib^{kj}$

21. Which of the following commands will produce: $\sqrt[3]{x^2+y^2+z^2}$

☐ `\sqrt{3}\sqrt{x^2+y^2+z^2}`

☐ `\sqrt[3]\sqrt{x^2+y^2+z^2}`

☑ `\sqrt[3]{x^2+y^2+z^2}`

☐ `\sqrt{3}{x^2+y^2+z^2}`

22. Which of the following commands can only be used in the preamble of a LaTeX document?

☐ `\parskip` ☐ `\usepackage` ☐ `\pagestyle` ☑ ALL of them

23. What is the action of clicking on the button created by:

```
\hyperlink{55}{\beamergotobutton{Go Back!}}
```

☐ goes to slide number 55

☑ goes to a slide whose label is 55

☐ goes to a slide whose title is 55

☐ ALL of the above

24. Consider the following set of commands that will produce a table:

```
\begin{tabular}{|l|c|c|r|}
\hline
Given Name & Age & Weight (Kg)& Height (cm) \\
\hline \hline
John & 75 & 80 & 180 \\
Tom & 25 & 65 & 173 \\
Sally & 30 & 40 & 155 \\
\hline
\end{tabular}
```

Which of the following statements about the above table is correct?

- ☐ The table has 5 columns and 4 rows
- ☐ ALL the rows are separated by a horizontal line
- ☑ ALL the columns are separated by vertical lines
- ☐ The last row of the table has no horizontal line

25. Which of the following options is the exact depiction of the last row of the table in Question 24?

☑

Sally	30	40	155

☐

Sally	30	40	155

☐

Sally	30	40	155

☐

Sally	30	40	155

26. Which of the following options is the exact depiction of the first column of the table in Question 24?

☑

Given Name
John
Tom
Sally

☐

Given Name
John
Tom
Sally

☐

Given Name
John
Tom
Sally

☐

Given Name
John
Tom
Sally

27. Which of the following options is the exact depiction of the last column of the table in Question 24?

☐

Height (cm)
180
173
155

☐

Height (cm)
180
173
155

☑

Height (cm)
180
173
155

☐

Height (cm)
180
173
155

28. Which of the following statements will be treated as a comment by LaTeX?

☐ `$x^2 - 4$` ☑ `% \textbf{Hello}` ☐ `\\comment` ☐ `//comment`

29. Which of the following commands will downsize the figure by 30%?

☑ `\includegraphics[scale=0.7]{myPic}`

☐ `\includegraphics[scale=0.3]{myPic}`

☐ `\includegraphics[scale=70%]{myPic}`

☐ `\includegraphics[scale=30%]{myPic}`

30. What is the output of the following set of commands?

```
\begin{itemize}
\item[*] this is a star
\item[o] this is a circle
\item[-] this is a dash
\end{itemize}
```

☐
this is a star
this is a circle
this is a dash

☑
* this is a star
o this is a circle
– this is a dash

☐
- this is a star
- this is a circle
- this is a dash

☐
*1 this is a star
o2 this is a circle
–3 this is a dash

31. Consider the following set of commands in eqnarray (equation array) environment:

```
\begin{eqnarray}
f(x) & = & \sum_{n=0}^{\infty} \frac{x^n}{n!} \nonumber \\
& = & 1+x+\frac{x^2}{2}+\frac{x^3}{6}+ \cdots \nonumber \\
& = & e^x \nonumber
\end{eqnarray}
```

Which of the following options is the correct display of the equation array above?

☐
$$\begin{aligned} f(x) &= \sum_{n=0}^{\infty} \frac{x^n}{n!} \\ &= 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \cdots \\ &= e^x \end{aligned}$$

☑
$$\begin{aligned} f(x) &= \sum_{n=0}^{\infty} \frac{x^n}{n!} \\ &= 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \cdots \\ &= e^x \end{aligned}$$

☐
$$\begin{aligned} f(x) &= \sum_{n=0}^{\infty} \frac{x^n}{n!} \\ &= 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \cdots \\ &= e^x \end{aligned}$$

☐
$$\begin{aligned} f(x) &= \sum_{n=0}^{\infty} \frac{x^n}{n!} \\ &= 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \cdots \\ = e^x \end{aligned}$$

3. MATLAB

32. Which MATLAB command will clean the command window?

☐ `cls` ☐ `clear` ☑ `clc` ☐ `clean`

33. Which MATLAB command will delete a variable called z?

☐ `clean(z)` ☐ `clear(z)` ☐ `clc z` ☑ `clear z`

34. Which of the following MATLAB commands will have a suppressed output (shows no output)?

☐ `v=[1,2,3,4]:` ☑ `v=[1,2,3,4];` ☐ `v=[1,2,3,4],` ☐ `v=[1,2,3,4].`

35. Suppose that `q=[1,-1,1,0]` and `p=[-1,0,1,-1]`, What is the result of `q*p` in MATLAB?

☐ `[0;-1;2;-1]` ☐ `[0,-1,2,-1]` ☐ `[0]` ☑ `error`

36. Suppose that `q=[1,-1,1,0]` and `p=[-1;0;1;-1]`, What is the result of `q*p` in MATLAB?

☐ `[-1;0;1;0]` ☐ `[0,1,0,-1]` ☑ `[0]` ☐ `error`

37. Suppose that `R=[9,4,1;0,6,7;0,0,0]`. Which of the following statements is true?

- ☐ `R` is a row vector with 9 elements
- ☐ `R` is a column vector with 9 elements
- ☐ `R` is a matrix with 2 rows and 3 columns
- ☑ `R` is a matrix with 3 columns

38. Consider the vector `N=[3,-3,2,-2]`. What is the outcome of `M=N.^3`?

☐ `M=[9,-9,6,-6]` ☑ `M=[27,-27,8,-8]` ☐ `M=[27;-27;8;-8]` ☐ `error`

39. Consider running the following three lines of command in MATLAB Command Window:

```
1. >> t=3*0.4;
2. >> format rat;
3. >> t
4. >> ????
```

What would be the output on the fourth line (instead of ????)?

☐ `1.200` ☑ `6/5` ☐ `12e-1` ☐ `1.200000`

40. Which of the following commands divides the interval `[-1,1]` into 25 equally-spaced subintervals?

☑ `linspace(-1,1,26)` ☐ `linspace(-1,1,24)` ☐ `linspace(-1,1,25)` ☐ `linspace(-1,1,0.08)`

41. Consider the matrix `P=ones(10,5)`. What is the outcome of calling `sum(sum(P))`?

☑ 50 ☐ 10 ☐ 5 ☐ `error`

42. Consider the matrix `E=eye(5)`. What is the outcome of `E(:,end)=[]`?

- ☐ Deletes the last element of `E`
- ☐ Deletes the last row of `E`
- ☐ The size of matrix `E` becomes 4×5
- ☑ The size of matrix `E` becomes 5×4

43. Consider the vector `x` generated via `x=0:0.01:1;` What is the output of calling `length(x)`?

☐ 100 ☑ 101 ☐ 1001 ☐ 99

44. Consider the value `p=13.141516171819`. What is the output of calling `sprintf('p=%0.4f',p)`?

☐ `p=13.14` ☑ `p=0.1415` ☐ `p=13.1415` ☐ `p=13.0000`

45. Consider the matrix `A=[1,2,4;6,9,8;-1,5,4]` in MATLAB. What is the outcome of `A(A<5)=0`?

- ☐ All the elements of `A` become zero
- ☐ The elements on the last row of `A` become all zeros
- ☑ The elements on the first row of `A` become all zeros
- ☐ The elements on the first and the last row of `A` become all zeros

46. Which of the following commands will produce a random number between 10 and 100?

☐ `10*rand()+90` ☐ `10*rand()+89` ☑ `90*rand()+10` ☐ `100*rand()-10`

47. Which of the following commands generates a 10×10 matrix M with different random entries?

- ☐ `M=rand()*eye(10)`
- ☑ `M=rand(10)`
- ☐ `M=100*rand()*eye(10)`
- ☐ `M=rand()*ones(10)`

48. Which of the following `plot` commands will generate a dotted line curve?

- ☐ `plot(y,x,'--')`
- ☐ `plot(y,x,'-.-')`
- ☐ `plot(y,x,'dotted')`
- ☑ `plot(y,x,'..')`

49. Which of the following set of commands in MATLAB is most accurate?

- ☐ `ceil(0.05)=0.1; floor(-0.05)=0; round(1.488)=1`
- ☑ `ceil(0.05)=1; floor(-0.05)=-1; round(-1.488)=-1`
- ☐ `ceil(0.05)=0; floor(-0.05)=-0.1; round(-1.488)=-2`
- ☐ `ceil(0.05)=0.1; floor(-0.05)=0; round(-0.94)=-0.90`

50. Suppose `A=[1,2,3;4,5,6;7,8,9]`. Which of the following MATLAB commands will convert the matrix A to `A=[1,2,3;0,0,0;0,0,0]`?

- ☑ `A(2:3,:)=0`
- ☐ `A(1,:)=[1,2,3]`
- ☐ `A(:,2:3)=[0,0,0;0,0,0]`
- ☐ `A(2:3,end)=[0,0,0]`