Analysis 1-2021
Foundations of modeling

This exam consists of 40 multiple-choice questions. For each question, only one answer is correct. Each question is worth one point. The cesuur is 26.5, which means that you need 27 points to pass.

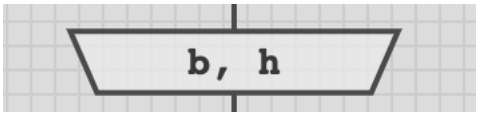
Write your answers on the answer sheet provided!

1	Von Neumann model is:	
	A	An architecture for stored-program computers, that identifies four key components: input, output, arithmetic-logic unit (ALU) and control unit.
	B	An architecture for fixed-program computers, that identifies four key components: input, output, arithmetic-logic unit (ALU) and control unit.
	C	An architecture for stored-program computers, that identifies four key components: input, output, central processing unit (CPU) and memory.
	D	An architecture for fixed-program computers, that identifies four key components: input, output, central processing unit (CPU) and memory.

2	A popular video game like League of Legends falls into which of the following categories?	
	A	Hardware.
	B	System software.
	C	Programming software.
	D	Application software.

3	A movie is stored on a VHS tape as an analog signal. What will happen to the stored information after copying it million times?	
	A	Nothing, every copy will be the same as the original.
	B	The stored data will deteriorate after copying.
	C	You cannot copy analog or digital signal.
	D	None of the above.

4	The following statements are related to software. Which statement is **False**?	
	A	Visual Studio Code is a programming software because it supports the developers to write application software.
	B	The system software consists of instructions for running the computer, running application software and running programming software.
	C	Windows is an application software because you need Windows to run applications.
	D	WhatsApp is an application software because it performs tasks for users.

5	The following symbol in the flowchart indicates one step in the algorithm where … 	
	A	… variables **b** and **h** get values from the standard input.
	B	… variables **b** and **h** print values to the standard output.
	C	… variable **b** is assigned the value variable **h** holds.
	D	… variables **b** and **h** are concatenated.

6	What are the steps needed to make a good algorithm?	
	A	Clearly distinguish between the steps.
	B	Each step must be unambiguous.
	C	It must finish after certain number of steps.
	D	All of the above.

7	Given the fact that X is the input and Y is the output of our program. Which one of the following lines of python codes calculates the remainder by division 10 using X as an input and outputs the resulting value to Y?	
	A	`X = Y // 10`
	B	`Y = X // 10`
	C	`Y = X % 10`
	D	`X = Y % 10`

8	Roman numeral system uses the following symbols to represent values: M – 1000, D – 500, C – 100, L – 50, X – 10, V – 5, I – 1. What is the biggest value that can be represented with the given symbols?	
	A	1000
	B	3999
	C	9999
	D	There is no limit. If you have enough space to write symbols, you can represent any large number (e.g. $1x10^{99}$)

9	Convert the binary number 1001010101011 to hexadecimal.	
	A	12AB
	B	4779
	C	9551
	D	9558

10	What would be the outcome of the following expression: 01101_2+0100_2= ?	
	A	10111_2
	B	010111111_2
	C	010001_2
	D	We cannot add these numbers.

11	How many different digits can you have in a base 7 numeral system, and what are those digits?	
	A	7 in total. Digits: 0, 1, 2, 3, 4, 5, 6.
	B	7 in total. Digits: 1, 2, 3, 4, 5, 6, 7
	C	8 in total. Digits: 0, 1, 2, 3, 4, 5, 6, 7
	D	6 in total. Digits: 1, 2, 3, 4, 5, 6,

12 Suppose a user runs the following code and enters the values as given below.

```
age = int(input("Enter age: "))
experience = int(input("Enter experience: "))

if (age > 40) or (experience >= 10):
    print("Hire")
else:
    score = input("Enter test score: ")
    if score > 8.5:
        print("Hire")
    else:
        print("Reject")
```

```
>>>
Enter age: 37
Enter experience: 7
Enter test score: 9
```

Which statement is correct?

	A	It shows an error
	B	It prints “Hire”
	C	It prints “Reject”
	D	It prints both “Hire” and “Reject” in two separate lines

13	What is wrong with the following code:
	`#Ask a user for an input number`
	`number = input("Enter the number")`
	`if number < 0:`
	`  print("Your number is negative")`
	`elif number == 0:`
	`  print("Your number is equal to 0")`
	`else:`
	`  print("Your number is positive")`

	A	There is a mistake in if-elif-else construction.
	B	Variable *number* is a string.
	C	The algorithm has an error with elif statement, where it assigns 0 to variable number.
	D	All of the above.

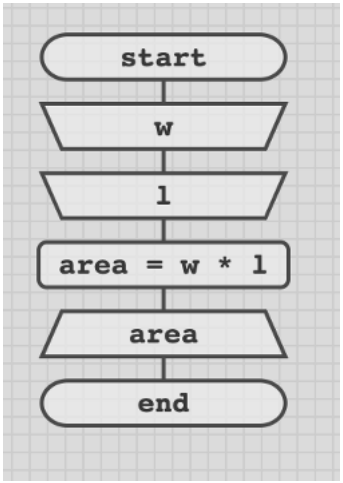
14	Which of the algorithms returns the 2nd from the last digit of the input?

	A	`number = number / 10`
		`temp = number % 10`
		`temp = int(temp)`
		`print(temp)`

	B	`number = number / 10`
		`temp = number % 10`
		`print(temp)`

	C	`temp = number % 100` `print(temp)`

	D	`number = number / 10`
		`temp = number % 10`
		`temp = float(temp)`
		`print(temp)`

15	How many input and how many output variables have been used in the following algorithm:  	
	A	2 input, 1 output
	B	1 input, 2 output
	C	2 input, 3 output
	D	1 input, 4 output

16	A logical implication (→) returns TRUE for all combinations **p** and **q**, except for one. What are the values of **p** and **q** when implication returns FALSE?	
	A	p = TRUE q = TRUE
	B	p = TRUE q = FALSE
	C	p = FALSE q = TRUE
	D	p = FALSE q = FALSE

17	Choose the correct logical expression that is equivalent to the following sentence: ''Due to corona regulations, if you have travelled to orange areas you have to stay home or if you have flu-like symptoms you stay home unless you get tested negative.''	
	A	p: you have travelled to an orange area q: you have flu-like symptoms r: you have tested negative t: stay home $(p \wedge (q \wedge \neg r)) \rightarrow t$
	B	p: you have travelled to an orange area q: you have flu-like symptoms r: you have tested negative t: stay home $(p \vee (q \wedge r)) \rightarrow t$
	C	p: you have travelled to an orange area q: you have flu-like symptoms r: you have tested negative t: stay home $(p \vee (q \wedge \neg r)) \rightarrow t$
	D	p: you have travelled to an orange area q: you have flu-like symptoms r: you have tested negative t: stay home $(p \wedge (q \vee r)) \rightarrow t$

18	What is the difference between NOR and XOR?	
	A	NOR is the opposite of OR. XOR is the exclusive OR.
	B	NOR is the exclusive OR. XOR is the negation of OR.
	C	NOR is the opposite of OR. XOR is the equivalent of AND.
	D	NOR is the equivalent of AND. XOR is the exclusive OR. .

19 Fill in the missing values of a truth table

P	Q	R	P ∧ (¬ Q → R)
T	T	T	
T	T	F	
T	F	T	
T	F	F	
F	T	T	
F	T	F	
F	F	T	
F	F	F	

A

P	Q	R	P ∧ (¬ Q → R)
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	T
F	T	T	T
F	T	F	T
F	F	T	T
F	F	F	T

B

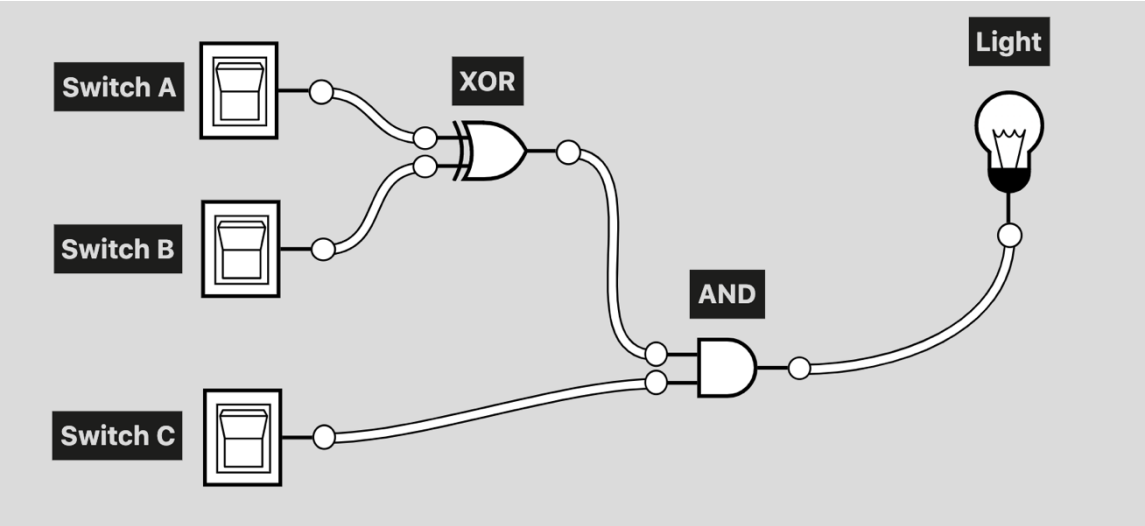
P	Q	R	P ∧ (¬ Q → R)
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	F
F	T	F	T
F	F	T	F
F	F	F	T

C

P	Q	R	P ∧ (¬ Q → R)
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	F
F	T	T	F
F	T	F	F
F	F	T	F
F	F	F	F

	D	

P	Q	R	P ∧ (¬ Q → R)
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	T
F	T	F	F
F	F	T	T
F	F	F	F

20	A room has one lamp and three switches. An electrician has connected switches A and B using XOR gate. Then, that output is connected with switch C using AND gate. The output of the AND gate is connected to the lamp. When a switch is ON position it sends a TRUE value. When a switch is in OFF position it sends a FALSE value. The light (lamp) is ON, when it receives a TRUE value.  Identify the conditions for the light to be ON.	
	A	There is 1 case for the light to be ON: 1. switch A is ON, switch B is ON, switch C is ON.
	B	There are 2 cases for the light to be ON: 1. switch A is ON, switch B is OFF, switch C is ON. 2. switch A is OFF, switch B is ON, switch C is ON.
	C	There are 2 cases for the light to be ON: 1. switch A is OFF, switch B is OFF, switch C is ON. 2. switch A is ON, switch B is ON, switch C is ON.
	D	There are 3 cases for the light to be ON: 1. switch A is ON, switch B is OFF, switch C is ON. 2. switch A is OFF, switch B is ON, switch C is ON. 3. switch A is ON, switch B is ON, switch C is ON.

21	Which of the following sentences is a statement (in Boolean logic)?	
	A	To get to Wijnhaven 107, exit the metro at Beurs.
	B	Hello world!
	C	An apple is an animal.
	D	Why did the chicken cross the road?

22	Consider the following statement: "***You will get a good job and will be well paid only if you master the Analysis course.***" And its propositions: P: "You will get a good job." Q: "You will be well paid." R: "You master the Analysis course." What is the correct logical expression for the above mentioned statement?	
	A	$(P \wedge Q) \leftrightarrow R$
	B	$R \rightarrow (P \vee Q)$
	C	$R \rightarrow (P \wedge Q)$
	D	$(P \wedge Q) \rightarrow R$

23 Which Boolean logic operator should replace the '□' to get the following truth table?

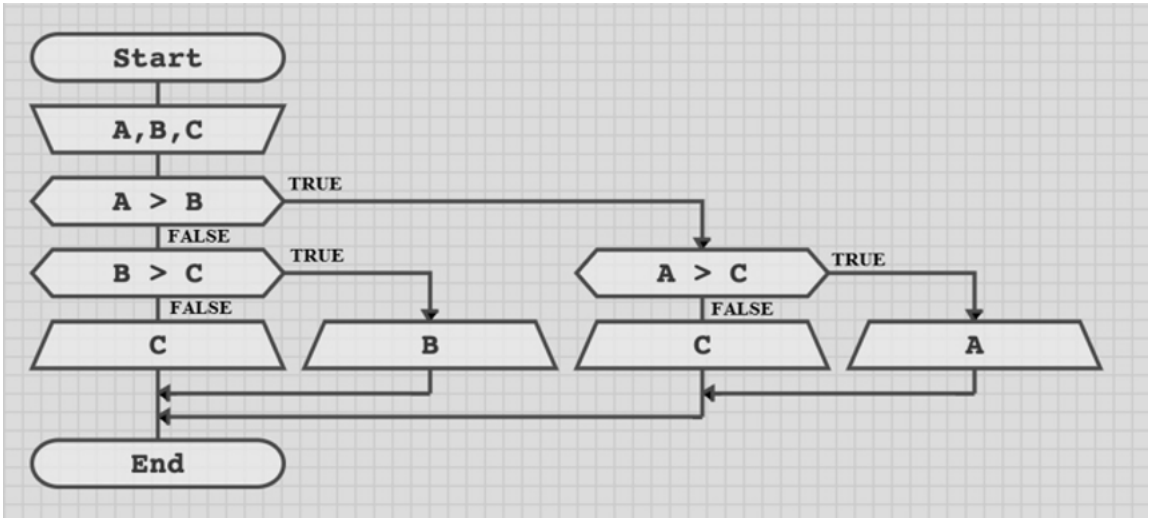
P	Q	P □ Q
TRUE	TRUE	TRUE
TRUE	FALSE	FALSE
FALSE	TRUE	FALSE
FALSE	FALSE	TRUE

	A	↓
	B	→
	C	↔
	D	∴

24 What will the following program print?

```
p = True
q = False
a = 2
b = 7
c = b // a * 2 ** 2
r = not p and not q or p
print(c,r)
```

	A	`12 False`
	B	`12 True`
	C	`36 False`
	D	`36 True`

25	What does the following algorithm do?  	
	A	For three numbers given by the user, this algorithm prints them in the following order: C, B, C, A.
	B	For three numbers given by the user, this algorithm prints the middle number.
	C	For three numbers given by the user, this algorithm prints the biggest number.
	D	For three numbers given by the user, this algorithm prints the smallest number.

26	Transform the following Boolean expression in Python using DeMorgan's law. `not( x <= 0  or  y == 0 )`	
	A	`x > 0 or y != 0`
	B	`x > 0 and y != 0`
	C	`x >= 0 or y != 0`
	D	`x >= 0 and y != 0`

27	What is the name of the following deductive argument? "If I study, I will pass ANL1. I study. Therefore, I will pass ANL1"	
	A	Modus ponens
	B	Modus tollens
	C	Hypothetical syllogism
	D	This argument is invalid, hence none of the above.

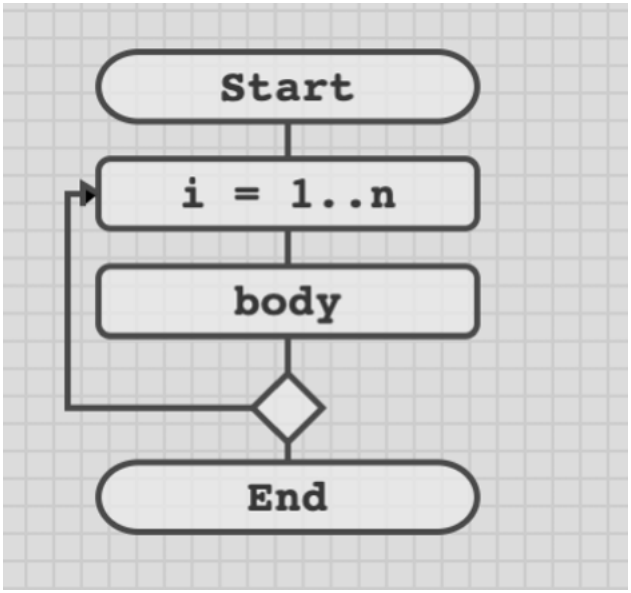
28	Which code generates the following three even numbers as output? 0 2 4	

	A	`number = 4`
		`i = 0`
		`while i <= number:`
		`    if i % 2 == 0:`
		`        print(i)`
		`    i=i+1`

	B	`number = 4`
		`i = 0`
		`while i < number:`
		`    if i % 2 == 0:`
		`        print(i)`
		`    i=i+1`

	C	`number = 4`
		`i = 0`
		`while i <= number:`
		`    if i % 2 == 0:`
		`        print(i)`
		`i=i+1`

	D	`number = 4`
		`i = 0`
		`while i < number:`
		`    if i % 2 == 0:`
		`        print(i)`
		`i=i+1`

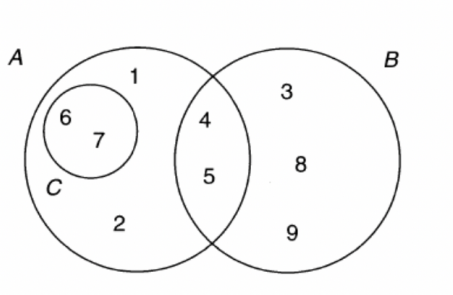
29	What kind of an algorithm is given by the flowchart below?  	
	A	This is a linear algorithm.
	B	This is a branching algorithm that uses IF statement.
	C	This is a cyclic algorithm that is using WHILE loop.
	D	This is a cyclic algorithm that is using a FOR loop.

30	Let A = $\{n^2 + n^3 \mid n \in \{1, 2, 3\}\}$ What are the members of set A?	
	A	A = {1, 2, 3, ...}
	B	A = {1, 2, 3, 12, 36}
	C	A = {1, 4, 8, 9, 27}
	D	A = {2, 12, 36}

31	Let A be the set of all prime numbers less than 20. Which of the following statements is correct?	
	A	$6 \in A$
	B	$7 \notin A$
	C	$11 \in A$
	D	A is an infinite set.

32	Let A = {1, 2, 3, 4, 5}. How many <u>proper</u> subsets does the set A have?	
	A	4
	B	15
	C	31
	D	32

33	How many elements does the set {1, 2, 3, 1+1, 2+2, 3+3} have?	
	A	3
	B	4
	C	5
	D	6

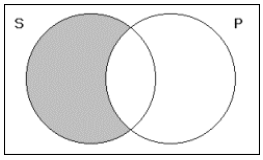
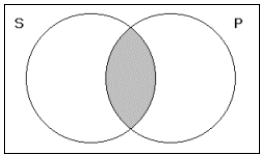
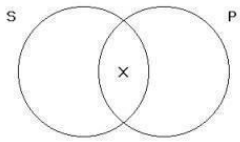
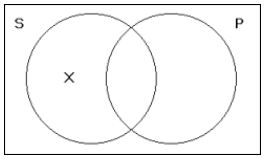
34	Venn diagram below depicts three sets A, B and C and their elements.  What are the elements of (A ∩ B) ∪ C ?	
	A	(A ∩ B) ∪ C = {1, 2, 3, 4, 5, 6, 7, 8, 9}
	B	(A ∩ B) ∪ C = {4, 5}
	C	(A ∩ B) ∪ C = {6, 7, 3, 8, 9}
	D	(A ∩ B) ∪ C = {4, 5, 6, 7}

35	In the class of 35 students, 19 learn Spanish, 18 learn French, and 3 neither Spanish nor French. Calculate how many students take ONLY French?	
	A	13
	B	14
	C	15
	D	16

36	What will be the printout after executing the following Python code?
	`A = (1, 2, 3)`
	`for i in range(len(A)):`
	`    A[i] = A[i] * 2`
	`print(A)`	

	A	`1 2 3 1 2 3`
	B	`1 2 3`
	C	`2 4 6`
	D	Python will raise an error.

37	What output do you get when you type `len(range(12,19))` in Python console?	
	A	7
	B	8
	C	12
	D	19

38	Which of the following Venn diagram represents the categorical proposition "**no** S is P"?	
	A	
	B	
	C	
	D	

39	A club has 20 members. Of those, 8 are men. 8 members didn't pay the membership. How many women didn't pay the membership if there are 6 women that payed the membership?	
	A	2
	B	4
	C	6
	D	8

40	What is a set in Python?	
	A	A set is an immutable ordered sequence of elements.
	B	A set is a mutable ordered sequence of elements.
	C	A set is a mutable unordered sequence of elements.
	D	A set is an immutable unordered sequence of elements.

Answers:

1	C
2	D
3	B
4	C
5	A
6	D
7	C
8	B
9	A
10	C
11	A
12	A
13	B
14	A
15	A
16	B
17	C
18	A
19	C
20	B
21	C
22	D
23	C
24	B
25	C
26	B
27	A
28	A
29	D
30	D
31	C
32	C
33	C
34	D
35	A
36	D
37	A
38	B
39	C
40	C