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NAME.....CLASS.....

COMPUTER SCIENCE

FORM 6 **MID TERM EXAMINATION 2025**

SYLLABUS CODE 9618 **PAPER 1 AND 3 THEORY FUNDAMENTALS**

TIME **1 HOUR 30 MINUTES** **DATE :**

Candidates answer on the question paper

INSTRUCTIONS TO CANDIDATES

1. Write your name and class in the space at the top of this page.
2. Answer all the questions in the spaces provided. If additional space is required, you should use the lined page at the end of this question paper. The question number(s) must be clearly shown.
3. The use of an electronic calculator is not allowed
4. You are reminded of the need for clear presentation in your answers.
5. The number of marks is given in brackets [] at the end of each question or part question.

Total Marks : 77

1 Anya scans an image into her computer for a school project.

(a) The scanned image is a bitmapped image.

(i) Complete the following table to describe the two terms about graphics.

Term	Description
Pixel
File header

[2]

(ii) The image is scanned with an image resolution of 1024×512 pixels, and a colour depth of 8 bits per pixel.

Calculate an estimate for the file size, giving your answer in mebibytes. Show your working.

Working
.....
.....
.....
.....

Answer mebibytes

[3]

(b) The image is compressed using lossless compression.

Identify **one** method of lossless compression that can be used to compress the image **and** describe how the method will reduce the file size.

Lossless compression method

Description

[3]

- (c) One of the colours used in the image has the hexadecimal colour code:

#FC238A

FC is the amount of red, 23 is the amount of green and 8A is the amount of blue in the colour.

- (i) Convert the hexadecimal code FC into denary.

..... [1]

- (ii) The amount of green in binary is 00100011. This has the denary number 15 added to it to create a second colour.

Add the denary number 15 to the binary number 00100011 and give your answer in binary.

Perform the addition in binary. Show your working.

Working

.....

.....

.....

.....

Answer (in binary)

[3]

- (iii) Hexadecimal 23 in two's complement representation is 00100011. The denary number 10 needs to be subtracted from this value.

Subtract the denary number 10 from the two's complement representation 00100011.

Give your answer in binary. Show your working.

Working

.....

.....

.....

Answer (in binary)

[3]

- 2** Bingwen's computer comes with an Operating System and utility software.

- (a) Draw **one** line from each utility software to its correct description.

Utility software	Description
	Scans software for errors and repairs the problems
Disk formatter	Moves parts of files so that each file is contiguous in memory
Defragmentation	Creates a copy of data that is no longer required
Back-up	Sets up a disk so it is ready to store files
Disk repair	Scans for errors in a disk and corrects them
	Creates a copy of data in case the original is lost

[4]

- (b) Identify **four** key management tasks that the Operating System will perform.

- 1
- 2
- 3
- 4

[4]

- 3** A processor has one general purpose register, the Accumulator (ACC), and several special purpose registers.

- (a) Complete the following description of the role of the registers in the fetch-execute cycle by writing the missing registers.

The holds the address of the next instruction to be loaded. This address is sent to the

The holds the data fetched from this address.

This data is sent to the and the Control Unit decodes the instruction's opcode.

The is incremented.

[5]

- 4 The following table shows part of the instruction set for a processor. The processor has two registers: the Accumulator (ACC) and an Index Register (IX).

Instruction		Explanation
Opcode	Operand	
LDM	#n	Immediate addressing. Load the number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
LDI	<address>	Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the Index Register. Copy the contents of this calculated address to ACC
LDR	#n	Immediate addressing. Load the number n to IX
ADD	#n/Bn/&n	Add the number n to the ACC
ADD	<address>	Add the contents of the given address to the ACC
SUB	#n/Bn/&n	Subtract the number n from the ACC
SUB	<address>	Subtract the contents of the given address from the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)

<address> can be an absolute or a symbolic address
denotes a denary number, e.g. #123
B denotes a binary number, e.g. B01001010
& denotes a hexadecimal number, e.g. &4A

- (a) The current contents of memory are shown:

Address	Data
19	24
20	2
21	1
22	3
23	5
24	4
25	22

The current contents of the ACC and IX are shown:

ACC	12
IX	1

Complete the table by writing the content of the ACC after each program has run.

Program number	Code	ACC content
1	LDD 20 ADD #2	
2	LDX 22	
3	LDI 25 INC ACC SUB 22	
4	LDD 19 LDM #5 LDM #25	

[4]

(b) The processor includes these bit manipulation instructions:

Instruction		Explanation
Opcode	Operand	
AND	#n/Bn/&n	Bitwise AND operation of the contents of ACC with the operand
AND	<address>	Bitwise AND operation of the contents of ACC with the contents of <address>
XOR	#n/Bn/&n	Bitwise XOR operation of the contents of ACC with the operand
XOR	<address>	Bitwise XOR operation of the contents of ACC with the contents of <address>
OR	#n/Bn/&n	Bitwise OR operation of the contents of ACC with the operand
OR	<address>	Bitwise OR operation of the contents of ACC with the contents of <address>

<address> can be an absolute or a symbolic address
denotes a denary number, e.g. #123
B denotes a binary number, e.g. B01001010
& denotes a hexadecimal number, e.g. &4A

The current contents of memory are shown:

Address	Data
30	01110101
31	11111111
32	00000000
33	11001100
34	10101010

The current content of the ACC is shown:

1	0	0	1	1	0	1	0
---	---	---	---	---	---	---	---

Complete the table by writing the content of the ACC after each program has run.

The binary number 10011010 is reloaded into the ACC before each program is run.

Program number	Code	ACC content
1	AND 31	
2	XOR B01001111	
3	OR #30	

[3]

- 5** An assessment board wants to store the marks students achieved in exams in a database named RECORDS.

Part of the database design includes these two tables:

EXAM(ExamID, Subject, Level, TotalMarks)

EXAM_QUESTION(ExamQuestionID, ExamID, QuestionNumber, Question, MaxMark)

- (a)** Identify the relationship between EXAM and EXAM_QUESTION.

.....
..... [1]

- (b)** Sample data for the table EXAM is shown:

ExamID	Subject	Level	TotalMarks
00956124	Computer Science	2	75
00956125	Computer Science	3	120
00956126	Mathematics	2	100
00956127	Mathematics	3	150
00956128	Physics	2	70
00956129	Physics	3	80

Write a Structured Query Language (SQL) script to define the table EXAM.

.....
.....
.....
.....
.....
..... [3]

- (c)** The table EXAM_QUESTION has been created but the foreign key has not been linked.

Write an SQL script to update EXAM_QUESTION and link the foreign key to EXAM.

.....
.....
.....
..... [2]

- (b)** The company is using a Database Management System (DBMS) to set up the database.

Describe what is meant by the following DBMS features:

Data dictionary

.....
.....
.....

Logical schema

.....
.....
.....

[4]

6 Complete the binary addition. Show your working.

$$\begin{array}{r} 10011110 \\ 01100001 \\ + \underline{00011001} \end{array}$$

[3]

- 7 A business is creating a local area network (LAN) in its office.

- (a) The business is deciding which topology to use.

Tick (\checkmark) **one or more** boxes in each row to identify the topology, or topologies, each statement describes.

Statement	Bus	Star	Mesh
all devices connect to one central device			
all devices connect to a central cable			
multiple paths for the packets to travel along			
robust against damage because if any line fails, the rest of the network retains full functionality			
most likely to lose data through collisions			

[5]

- (b) The LAN will connect to the internet through a router. The router has a public IPv6 address.

- (i) State why the router has a public IP address.

.....
..... [1]

- (ii) One difference between an IPv4 and IPv6 address is that the numbers in an IPv4 address are separated by full stops and in an IPv6 address they are separated by colons.

Identify **two other** differences between an IPv4 and IPv6 address.

1

.....
.....

2

.....
.....

[2]

8 Real numbers are stored in a computer system using floating-point representation with:

- 8 bits for the mantissa
- 8 bits for the exponent
- two's complement form for both mantissa and exponent.

(a) Write the normalised floating-point representation of +202 in this system.
Show your working.

Mantissa

--	--	--	--	--	--	--	--

Exponent

--	--	--	--	--	--	--	--

Working

[3]

(b) Write the normalised floating-point representation of -202 in this system.
Show your working.

Mantissa

--	--	--	--	--	--	--	--

Exponent

--	--	--	--	--	--	--	--

Working

[3]

- (c) A binary number is stored in the computer system.

Mantissa	Exponent
0 0 0 1 1 1 1 0	0 0 0 1 1 0 0 0

- (i) State why the number is **not** normalised.

.....
..... [1]

- (ii) Write the normalised floating-point representation of the number.

Mantissa	Exponent
_____	_____

[2]

- 9** Data types can be classified as composite or non-composite.

A record is declared of type **box** using the following pseudocode.

```
TYPE size = (small, medium, large)
```

```
TYPE box
```

```
    DECLARE volume : size
```

```
    DECLARE price : REAL
```

```
    DECLARE colour : STRING
```

```
ENDTYPE
```

```
DECLARE myBox : ARRAY [1:6] OF box
```

- (a) (i)** Identify **one** composite and **three** non-composite data types used in the pseudocode.

Composite data type

Non-composite data type 1

Non-composite data type 2

Non-composite data type 3

[4]

- (ii)** Identify the data type in the pseudocode that is enumerated.

..... [1]

- (b)** A box is red, with medium volume and a price of \$10.99.

Write **pseudocode** to store the details of this box in the first element of the array.

.....
.....
.....
.....

[3]

10 Enumerated and pointer are two non-composite data types.

- (a) Write **pseudocode** to create an enumerated type called `Parts` to include these parts sold in a computer shop:

Monitor, CPU, SSD, HDD, LaserPrinter, Keyboard, Mouse

.....
.....
.....

[2]

- (b) Write **pseudocode** to create a pointer type called `SelectParts` that will reference the memory location in which the current part name is stored.

.....
.....
.....

[2]