

General Certificate of Advanced Level Examination

Term – 5, 2022

Conducted by Field Work Center (FWC), Thondaimanaru

Information & Communication Technology (ICT)

தகவல் தொடர்பாடல் தொழினுட்பவியல் I Information & Communication Technology I	Part - I *Gr. 13 (2022)*	20	E	I

Instructions:

- *Answer all questions.*
- *Write down your index number on the space provided.*
- *In each of the questions 1 to 50, pick one of the alternatives (1),(2),(3),(4),(5) which is correct or most appropriate. Mark a cross (X) on the number corresponding to your choice in the answer sheet provided.*
- *No use of calculators.*

1. Who is considered as the creator of first digital electronic computer?

(1) George Boole (2) Alan Turning (3) John V.Atanasoff
(4) Charles Babbage (5) John Von nuemann

2. Which of the following statement(s) is /are correct about device drivers?

A - They provide software interfaces for hardware
B - They provide hardware interfaces for software
C - They act as a tranalator between hardware devices and applications

(1) A only (2) B only (3) A,B only (4) A,C only (5) B,C only

3. Consider the following paragraph with the blank spaces.

"……❶…… consists of low-level software that controls the system hardware. The BIOS is preloaded into ……❷……., and some is loaded into ……❸……. from harddisk".

Which of the following relevant group is suitable to fill in the blanks ❶,❷,❸ respectively?

(1) ROM, RAM, BIOS (2) ROM, BIOS, RAM (3) RAM, ROM, BIOS
(4) BIOS, ROM, RAM (5) RAM, BIOS, ROM

4. Consider the following statements.

A - central processing unit performs fetch-decode-execute cycle for each instruction during the execution of a program
B - Decoding is perfommed by control unit in fetch-decode-execute cycle
C - Cache memory performs fetch-decode-execute cycle

Which of the above is /are true about fetch-decode-execute cycle of the central processing unit?

(1) A only (2) B only (3) C only (4) A,B only (5) A,C only

[See page 2

5. Consider the following statements.

A - Delivering a proprietary licensed software to another one without the permission of its owner

B - A hospital provides personal information of patients to a insurance company without the knowledge of the patients

C - Spreading viruses into others' computers

Which of the above is /are computer's unethical behaviour(s)?

(1) A only (2) B only (3) A,B only (4) A,C only (5) A,B,C all

6. The component which has the address of the next instructions fetched into central processing unit is called ……..

(1) Program counter (PC) (2) Arithmetic logic unit (3) Control unit

(4) Register (5) Main memory

7. Which of the following can be obtained by simplifying Boolean expression $\overline{(A+\bar{B}).(\bar{D}+F)}$ using De Morgan's Law?

I - $\bar{A}.B+D.\bar{F}$ II - $A.\bar{B}+\bar{D}.F$ III - $\overline{(A+\bar{B})}+\overline{(\bar{D}+F)}$

(1) I only (2) II only (3) III only (4) I,II only (5) I,III only

8. Consider the following Karnaugh map.

CD \ AB	00	01	11	10
00	**0**	**0**	**1**	**1**
01	**1**	**1**	**0**	**1**
11	**1**	**0**	**0**	**1**
10	**0**	**0**	**1**	**1**

Which of the following Boolean expression(s) is /are represented by the Karnaugh map?

I - $(A+D)(\bar{A}+\bar{B}+\bar{D})(\bar{B}+\bar{C}+\bar{D})$

II - $(A+D)(\bar{A}+\bar{B}+\bar{D})(A+\bar{B}+\bar{C})$

III - $AD+\bar{A}\bar{B}\bar{D}+\bar{B}\bar{C}\bar{D}$

(1) I only

(2) II only

(3) III only

(4) I,II only

(5) I,III only

9. If X = 10100010_2 and Y = 11101010_2, what will be the value of X NOR Y?

(1) 11101110_2 (2) 11100010_2 (3) 00010101_2 (4) 00101010_2 (5) 10001010_2

10. What is the 2's complement form of (12_{10}) + (-25_{10})?

(1) 10011000_2 (2) 11111000_2 (3) 11101000_2 (4) 11101000_2 (5) 11110011_2

11. Which of the following is the decimal form of binary number 1001001.011 ?

(1) 73.375 (2) 72.325 (3) 145.325 (4) 145.375 (5) 73.75

12. Consider the following statements.

A - Operating system is a type of an application software

B - Operating system manages hardware and software resources

C - Operating systems with graphical user and command line interfaces (GUI/CLI) are in usage

Which of the above is /are correct realted to an operating system?

(1) A only (2) B only (3) A,B only (4) A,C only (5) B,C only

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13. In operating syste, below are some properties of contiguous allocation used to allocate space for the files. Which of the following is /are true?

A - File size is needed to know at the time of creation

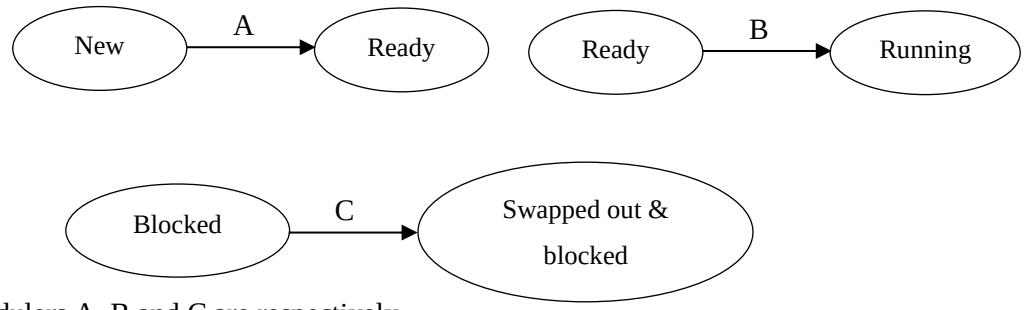
B - Extending file size is difficult

C - External fragmentation

D - Inside each block, a link is maintained to point to where the next block of the file is.

(1) A only (2) B only (3) B,C only (4) A,D only (5) A,B,C only

14. Consider the following state transitions of the processes in an operating system. A, B and C are the schedulers.



The schedulers A, B and C are respectively.

(1) Short term, long term and medium term (2) Medium term, long term and short term

(3) Long term, short term and medium term (4) Long term, medium term and short term

(5) Short term, medium term and long term

15. Consider the following paragraph with the blank spaces.

A ……①…….. is a ……②…… in execution. A process will need certain ……③……. such as CPU time, memory, files, and I/O devices to accomplish its task. These are allocated to the process either when it is created or while it is executing.

Which of the following relevant group is suitable to fill in the blanks ①,②,③ respectively?

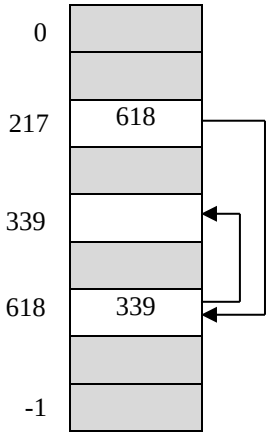
(1) Program, Process, Resources (2) Resources, Process, Program

(3) Process, Resources, Program (4) Process, Program, Resources

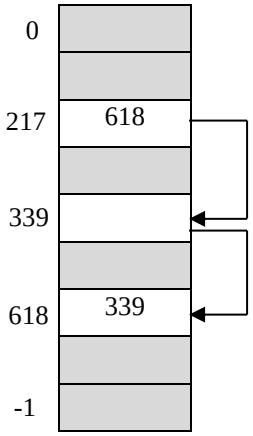
(5) Program, Resources, Process

16. File allocation tables of the file "myfile.py" is shown below. Which one is correct out of them? (suppose that the start entry of the file is 217).

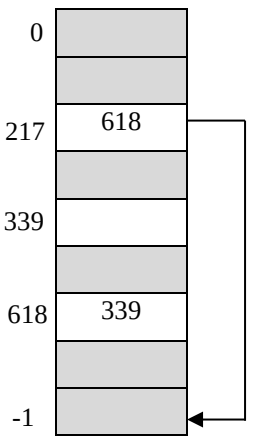
(1)



(2)



(3)



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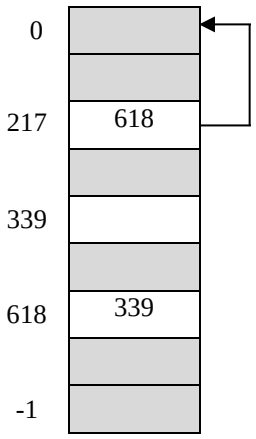
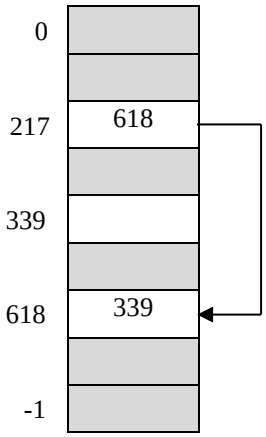
(4)



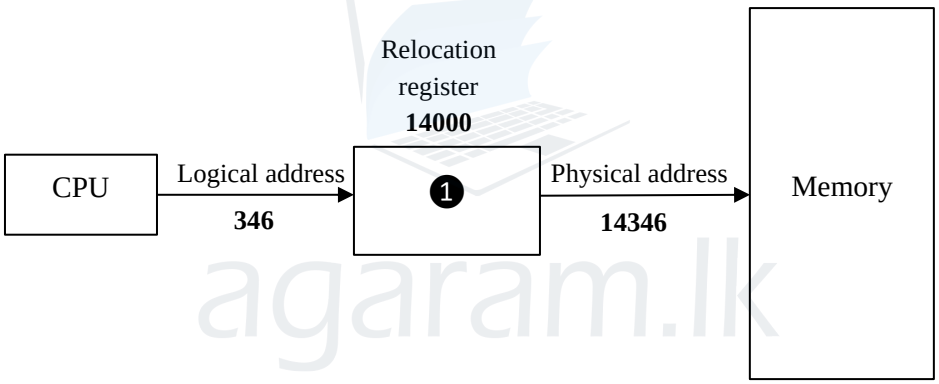
(5)



17. Which of the following information that is not contained in the process control block (PCB) of an operating system?

(1) Process number (2) Program counter (3) Page fault
(4) Register information (5) Process state

18. Consider the following illustration about operating system.



In the illustration given above, which of the following represnts ❶?

(1) Virtual memory (2) Memory management unit (MMU) (3) Page
(4) Offset (5) Frame

19. Which of the following media types give the correct price or cost order?

(1) Co-axial cable < Twisted pair cable < Fiber optical cable
(2) Co-axial cable < Fiber optical cable < Twisted pair cable
(3) Twisted pair cable < Co-axial cable < Fiber optical cable
(4) Co-axial cable < Fiber optical cable < Twisted pair cable
(5) Twisted pair cable < Fiber optical cable < Co-axial cable

20. Which of the following is correct about data communication and computer networks?

(1) IP address for network interface card (NIC) is defined by the manufacturer
(2) MAC address for network interface card is defined by the manufacturer
(3) Network switch is a type of router that performs the packet switching
(4) Signal generating in a port of a network switch is sent to all the ports of the network switch
(5) Proxy server automatically resolves the IP addresses to the computers

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A computer with IP address 192.248.16.10 is allocated in a network. Its broadcast address is 192.248.16.31. Answer the questions **(21)** and **(22)** using this information.

21. What is the subnet mask of this network?

(1) 255.255.255.0 (2) 255.255.0.0 (3) 192.248.16.192
(4) 255.255.255.224 (5) 255.255.255.248

22. What is the network address of this network?

(1) 192.248.16.128 (2) 192.248.16.0 (3) 192.248.0.0
(4) 192.248.16.192 (5) 192.248.16.255

23. Which of the following best describes the purpose of virtual private network (VPN)?

(1) A secure communication via the Internet
(2) A private communication via the Internet
(3) A confidential communication via the Internet
(4) Connecting an organization in the Internet
(5) Connecting two Internet Service Providers (ISP) via the Internet

24. The medium access control (MAC) sublayer is responsible for dealing with additional issues caused by broadcasting networks. Which is the layer in the OSI reference model that contains the MAC sublayer?

(1) Physical layer (2) Network layer (3) Transport layer
(4) Datalink layer (5) Application layer

25. Person X likes to send the message HACKING to person Y securely. For this, he /she encrypts that message by using +2 encryption key. Which of the following may be the encrypted (cipher) message?

(1) IPKMECJ (2) IBDLJOH (3) GNIKCAH (4) HOJLDBI (5) JCEMKPI

26. Which of the following is /are incorrect about firewall?

A - It can be in the form of hardware and software
B - It can completely prevent unauthorized access to the computer network
C - It is a device used to protect all the computing devices connected to the network from fire and lightning

(1) A only (2) B only (3) A,B only (4) A,C only (5) B,C only

27. Which of the following is a type of information system that uses databases of expert knowledge to provide advice or make decisions in areas such as clinical diagnosis?

(1) Transaction processing system
(2) Executive information system
(3) Expert system
(4) Geographical information system
(5) Management information system

28. The …….. phase of the system development life cycle defines the business requirements for the new system. Which of the following is most suitable to fill the blank in?

(1) Requirements analysis (2) System design (3) System development
(4) System maintenance (5) System testing

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29. "In the development process model, the various stages of software development are executed one after the other ……". Which of the following is most suitable to fill the blank in?
(1) Agile (2) Spiral (3) Waterfall (4) Incremental (5) Iterative

30. Consider the following statements about dataflow diagram (DFD) in structured system analysis design methodology (SSADM).

I

Question: Process which can not be further decomposed, is called elementary process
Answer: True

II

Question: Information from one data store to another data store should be transferred through a process
Answer: False

III

Question: Rectangle is used for external entity as a symbol
Answer: False

Which of the above is /are correct?
(1) I only (2) II only (3) III only (4) I,II only (5) I,III only

31. Testing method in which each individual part of the system is tested to ensure that it is correct, called.
(1) Unit testing (2) Whitebox testing (3) Blackbox testing
(4) User acceptance testing (5) Interface testing

32. Which of the following is a functional requirement of a web based online student management system in a university?
(1) System shall be able to use 24 x 7 time by all students
(2) System shall be able to provide accurate information about students
(3) System should be able to have easy-to-use interface
(4) Registered students shall be able to login into the system
(5) System shall be able to have 100% secure always

33. Which of the following is a part of data manipulation language (DML) of SQL used in relational database?
(1) CREATE (2) INSERT (3) ALTER (4) DROP (5) GRANT

34. Which of the following is correct answer connecting column A and column B in the table given below?

Column A		Column B	
I	Composite attribute	**A**	An attribute that cannot be broken down into smaller components
II	Simple attribute	**B**	An attribute that can be broken down into component parts
III	Multivalued attribute	**C**	An attribute whose values can be calculated from related attribute values
IV	Derived attribute	**D**	An attribute that may take on more than one value

(1) I-B, II-A, III-C, IV-D (2) I-B, II-D, III-A, IV-C (3) I-B, II-D, III-C, IV-A
(4) I-B, II-A, III-D, IV-C (5) I-B, II-C, III-A, IV-D

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35. Which of the following is correct about relational database keys?

(1) A composite key can be a primary key
(2) A primary key is chosen from alternate keys
(3) A primary key is chosen from foreign keys
(4) Candidate key is called foreign key
(5) Another name for alternate key is foreign key

36. Consider the following data table.

CustomerID	CustomerName	Address	City
C1	Rajah	7, College Lane, Jaffna	Jaffna
C2	Fernando	9, Lotus Avenue, Colombo-07	Colombo
C3	Raheem	St.Sebastian Mawatha, Kandy	Kandy
C4	John	33/5, KKS Road, Jaffna	Jaffna
C5	Perera	98, Tharmapala Mawatha, Galle	Galle
C6	Kanomikha	3/23, Moor street, Colombo-04	Colombo

Which of the following SQL is applied to the above table in order to obtain the result given below?

Count(CustomerID)	City
2	Jaffna
2	Colombo
1	Kandy
1	Galle

(1) *SELECT CustomerID, City FROM Customers GROUP BY City;*
(2) *SELECT COUNT(CustomerID), City FROM Customers GROUP BY CustomerID;*
(3) *SELECT COUNT(CustomerID), City FROM Customers ORDER BY City;*
(4) *SELECT COUNT(CustomerID), COUNT(City) FROM Customers;*
(5) *SELECT COUNT(CustomerID), City FROM Customers GROUP BY City;*

37. Consider the following *Customer* data table.

Customer (CustomerId, CustomerName, CustomerAddress, SpouseName, SpousePhone)

The following functional dependencies are here.

CustomerID → CustomerName, CustomerAddress, SpouseName, SpousePhone

SpouseName → SpousePhone

Which of the following normal form best describes *Customer* data table?

(1) 0NF (2) 1NF (3) 2NF (4) 3NF (5) BCNF

38. What will be the output after the Python statement *print(5 & 4 ^ 3 | 2)* is executed?

(1) 4 (2) 7 (3) 2 (4) 3 (5) 5

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39. Consider the following Python program.

```
x = 300
def myfunc():
  global x
  x = 200
myfunc()
print(x)
```

What will be the output when this program is executed?

(1) 300 (2) 500 (3) 200 (4) 100 (5) Error message

40. Consider the following Python program.

```
c = 0
s = input("Enter a string:")
ch = "a"
for i in s:
   if i == ch:
      c += 1
print(c)
```

Consider the following statements about this program.

A - Output value 4 is obtained when the user input is given as *malayalam*

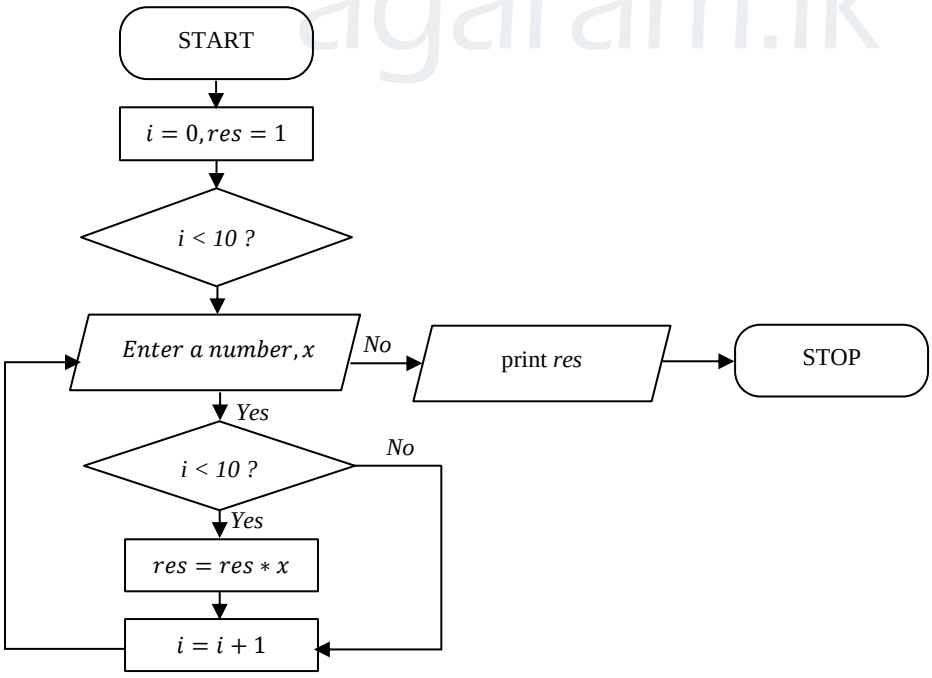
B - Output value *malayalam* is obtained again when the user input is given as *malayalam*

C - Output value *nohtyp* is obtained when the user input is given as *python*

Which of the above statement(s) is / are correct?

(1) A only (2) B only (3) A,C only (4) A,B,C only (5) A,B,C,D all

41. Consider the following statements about the algorithm given by flowchart.



A - Obtains ten numbers as inputs

B - If all the inputs are negative values, it will not generate any output

C - If all the inputs are greater than 10, it will generate an output

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Agaram.LK - Keep your dreams alive!

Which of the above is /are correct about the algorithm given above?

(1) A only (2) B only (3) C only (4) A,B only (5) A,B,C only

42. Which of the following Python program(s) is / are equivalent to the algorithm given above in **(41)**?

I

```
i=0
res=1
while i < 10:
    x=int(input('Enter a number:'))
    if x > 10:
        res=res*x
    i = i + 1
print(res)
```

II

```
i=0
res=1
for i in range(10):
    x=int(input('Enter a number:'))
    if not(x <= 10):
        res=res*x
    i = i + 1
print(res)
```

III

```
i=0
res=1
while i < 10:
    x=int(input('Enter a number:'))
    if x > 10:
        res=res*x
    i = i + 1
    if i > 10:
        break
print(res)
```

(1) I only (2) II only (3) III only (4) I,II only (5) I,II,III all

43. What will be the output if user input 60 is given to the following Python program?

```
n=int(input('Enter a number:'))
if n>0:
    if n>10:
        print('Good')
        if n<30:
            print('Nice')
    elif n>20:
        print('OK')
    else:
        print('Fine')
else:
    print('Sorry')
```

(1) Good
(2) Nice
(3) OK
(4) Fine
(5) Sorry

44. Consider the following Python program.

```
n = 345277
c = 0
while n != 0:
    n //= 10
    c += 1
print(str(c))
```

What will be the output when this program is executed?

(1) 5 (2) 6 (3) 772543 (4) 28 (5) 2

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45. Which of the following is / are correct about HTML?

A - It was created by Tim Berners Lee

B - It stands for Hypertext Manual Language

C - It is a standard markup language to create webpages

(1) A only (2) B only (3) A,B only (4) A,C only (5) A,B,C all

46. Which of the following HTML code is used to open a web page *"school.html"* on a new window?

(1) * Click *

(2) * Click *

(3) * Click *

(4) * Click *

(5) * Click *

47. Which of the following is correct HTML code about href attribute on a webpage?

(1) *<a href="../people/a.html>*

(2) *<img href="..img/b.gif>*

(3) *<frame href="../left.html>*

(4) *<iframe href="../content/video.html>*

(5) *<area href="http://www.yahoo.com>*

48. What will be the output of the following HTML code segment?

```
<body>
    <ul>
      <li> Violin </li>
      <li> Guitar
        <ul>
          <li> Electric Guitar </li>
          <li> Acoustic Guitar </li>
        </ul>
      </li>
      <li> Banjo </li>
    </ul>
</body>
```

(1)

- Violin
- Guitar
  - Electric Guitar
  - Acoustic Guitar
- Banjo

(2)

- Violin
- Guitar
  - Electric Guitar
  - Acoustic Guitar
- Banjo

(3)

- Violin
- Guitar
  - Electric Guitar
  - Acoustic Guitar
- Banjo

(4)

- Violin
- Guitar
  - Electric Guitar
  - Acoustic Guitar
- Banjo

(5)

- Violin
- Guitar
  - Electric Guitar
  - Acoustic Guitar
- Banjo

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49. Consider the following HTML code segment which is used to insert a video clip on a web page?

```
< ①  width=”300” height=”240” ②>
        <③ src=”movie.mp4” ④=”video/mp4”>
</video>
```

Which of the following is correct order for ①, ②, ③ and ④ ?

(1) embed, controls, source, type (2) video, controls, source, type (3) video, type, source, controls
(4) video, source, controls, type (5) embed, type, controls, source

50. Which of the following HTML code can be used to insert an inline frame on a webpage?

(1) *<inlineframe href="demo.html" height="200" width="300" title="display"></inlineframe>*
(2) *<frameset src="demo.html" height="200" width="300" title="display"></frameset>*
(3) *<frame src="demo.html" height="200" width="300" title="display"></frame>*
(4) *<iframe src="demo.html" height="200" width="300" title="display"></iframe>*
(5) *<frames href="demo.html" height="200" width="300" title="display"></frames>*

****

[End.

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தகவல், தொடர்பாடல் தொழினுட்பவியல் II
Information & Communication Technology II

Three Hours

Gr. 13 (2022)

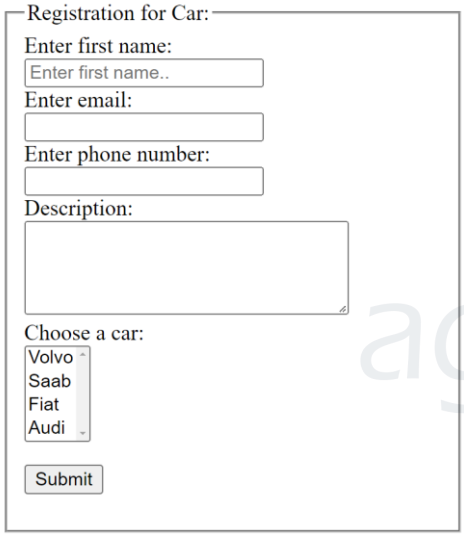
20 | E | A

Do not write in this column

Part – II A Structure Questions
Write down answers for all four questions on this sheet

(1)

(a) Consider the following HTML code and its output.




```
<!DOCTYPE html>
<html>
<head>
  <title> Registration </title>
</head>
<body>
  <①>
    <②> Registration for Car: </②>
    <form action="register.php" method="post">
      <label for="fname"> Enter first name: </label><br>
      <input type="③" id="fname" name="fname" ⑩="Enter first name.."><br>
      <label for="email"> Enter email: </label><br>
      <input type="④" id="email" name="email"><br>
```

[see page no. 2

```
        <label for="phone"> Enter phone number: </label><br>
        <input type="⑤" id="phone" name="phone" pattern="[0-9]{3}-[0-9]{2}-[0-9]{3}"><br>
        Description:<br>
        <⑥ name="message" rows="4" cols="30"> </⑥><br>
        <label for="cars"> Choose a car: </label><br>
        <⑦ id="cars" name="cars" size="4" multiple>
          <⑧ value="volvo"> Volvo </⑧>
          <⑧ value="saab"> Saab </⑧>
          <⑧ value="fiat"> Fiat </⑧>
          <⑧ value="audi"> Audi </⑧>
        </⑦>
        <p> <input type="⑨" value="Submit"> </p>
      </form>
    </①>
</body>
</html>
```

Do not write in this column

Fill in the blanks from ① to ⑩ using appropriate words in the following table.

No.	Words	No.	Words
①		⑥	
②		⑦	
③		⑧	
④		⑨	
⑤		⑩	

(b) Give the expected outputs of the following HTML code segments in the box given below when it is rendered by a web browser.

(i)

```
<body>
  <dl>
    <dt> Coffee </dt>
    <dd> - black hot drink </dd>
    <dt> Milk </dt>
    <dd> - white cold drink </dd>
  </dl>
</body>
```

[see page no. 3

Do not write in this column

(ii)

```
<body>
  <table border="1">
    <tr>
      <th colspan="2"> Name </th>
      <th> Age </th>
    </tr>
    <tr>
      <td> John </td>
      <td> Smith </td>
      <td> 46 </td>
    </tr>
    <tr>
      <td> Eve </td>
      <td> Jackson </td>
      <td> 21 </td>
    </tr>
  </table>
</body>
```

[see page no. 4

(2)

Do not write in this column

(a) Consider the following Python program.

```
mystr = "brown fox jumps over the lazy dog"
w = [i.lower() for i in mystr.split()]
w.sort()
for i in w:
  print(i,end=' ')
```

(i) Write down the output of this Python program.

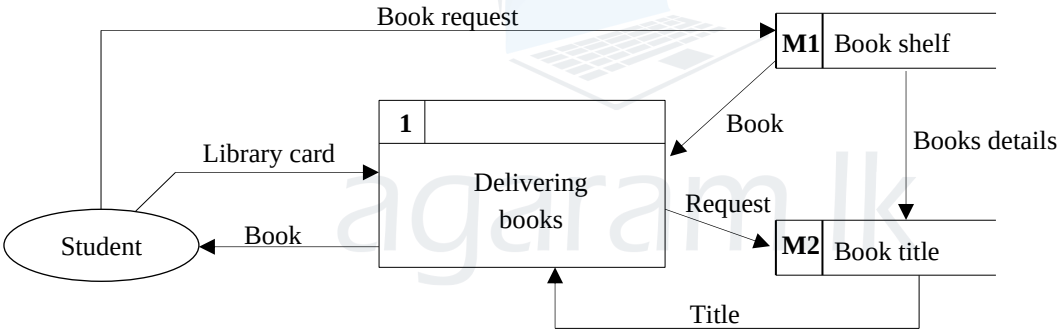
…….……

(ii) Write down briefly abou the purpose of this Python program.

……

……

(b) State two basic errors found in the following first level DFD segment about a student's request to borrow books in a library and how they could be corrected.



Error 1:

……

Correction:

……

……

Error 2:

……

Correction:

……

……

[see page no. 5

(c) Computer **A** sends the data 1010100 to computer **B**. During this, the computer uses the parity bit method to check errors. Below **(i)** uses the even parity bit method and **(ii)** uses the odd parity bit method. Write the appropriate bits in the boxes provided.

Do not write in this column

(i) 1010100 ☐

(ii) 1010100 ☐

(iii) Assume that computer B receives 1010111. If the computer uses the parity bit method to check the errors, can the computer detect erroneous data? or not? Give reason.

……

……

(3)

(a) Write each of the following statements about the operating syste as **true** if correct or **false** if incorrect.

(i) Operating system is a type of application software.

(ii) Program counter indicates the address of next instruction to execute the instruction.

(iii) The runtime mapping from virtual to physical memory address is done by the memory management unit.

(iv) Swapping is a mchanism in which a process can be swapped temporarily out of main memory to secondary stoage and make that memory available to other processes. At some later time, the system swaps back the process from the secondary storage to main memory.

(v) In pre-emptive scheduling, the CPU for each process is only given for a limited period of time.

(vi) Paging is a memory management technique in which process address space is broken into blocks of the same size called pages and the size of the process is measured in the number of pages.

No.	True / False	No.	True / False
(i)		(iv)	
(ii)		(v)	
(iii)		(vi)	

[see page no. 6

(b) Fill in the blanks in the following paragraph about operating system using appropriate words / phrases.

Do not write in this column

Every address generated by the CPU is divided into two parts: a ……①……. And a ……②…….. The first of the above is used to index into a ……③…… which contains the base address of each page in physical memory. This base address is combined with the ……②…… to define the physical memory address that is sent to the memory unit.

① .....

② .....

③ .....

(c)

(i) In relation to operating system, briefly explain what the Process Control Block (PCB) is.

……
……
……

(ii) What parameter does the process control block of the operating system maintain to uniquely identify a process?

……

(iii) Briefly explain what happens during the context switch among the processes.

……
……
……
……
……

[see page no. 7

(4)

Do not write in this column

(a) Consider the following two database tables.

Employee

ID	**FirstName**	**LastName**	**DepName**
1	Nehru	Selvam	Accounts
2	Janakan	Silva	Sales
3	Raj	Selvam	Customer Service
4	Perera	Priyanthi	Sales
5	Riswan	Hakeem	Accounts

Department

DepName	**Manager**
Accounts	1
Sales	4
Customer Service	3

(i) Explain with justification which normal form the *Department* table is.

……

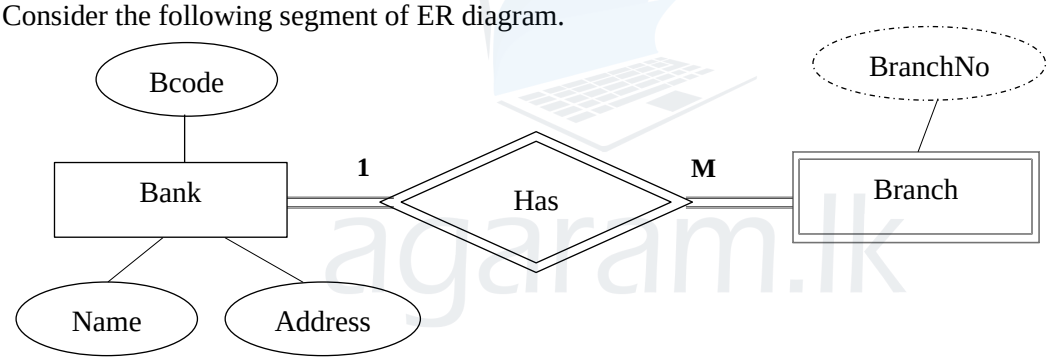
……

(ii) "*Employee* table is in third normal form". Is this statement correct? Give reason.

……

……

(b) Consider the following segment of ER diagram.



(i) Explain briefly why *Branch* entity is given in different symbol comparing with *Bank* entity.

……

……

(ii) Write down the attribute that identifies the records of Branch table uniquely.

……

(iii) Write down the entities in the form of schema if the ER diagram is mapped into tables.

……

……

……

****

[see page no. 8

General Certificate of Education (Adv. Level) Examination

Term – 5 (2022)

Conducted by Field Work Center (FWC), Thondaimanaru

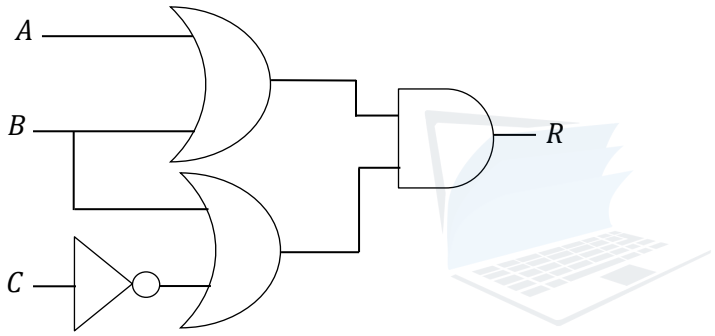
Information & Communication Technology (ICT)

தகவல், தொடர்பாடல் தொழினுட்பவியல் II Information & Communication Technology II	ICT Gr. 13 (2022)	20	E	B

Part – II B

Answer any four questions only.

(5) Consider the following combinational logic gate.



(a) Derive the output ***R***.

(b) Construct truth table for the output ***R***.

(c) Derive a Boolean expression in the form of SOP (sum of products) from the truth table.

(d) Derive a Boolean expression in the form of POS (Product of sums) from the truth table.

(e) Re-draw the logic circuit given above using NOR gates only.

(6)

(a) Write down any two functions of transport layer in OSI network reference model.

(b) Give one reason why UDP could be used instead of TCP in an application for live broadcasting in the Internet.

(c) Consider the following scenario.

A company situated in the capital city manufacturing cordial drinks has four local area networks (LANs) for each of its departments such as information system, production, marketing and accounting. Each department consists of the number of computers as follows in the table given.

[see page no. 9

Departments	Number of computers in each department
Information System	*20*
Production	*23*
Marketing	*18*
Accounting	*19*

An IP block 192.248.16.0/27 is given to the network administrator. The network administrator is required to allocate IP addresses for all nodes in each department. Four subnets are to be setup for this purpose and this network is connected to a public IP address for the Internet usage of the employees. Each department is situated in different building in an area. Each department has a network printers separately. A firewall is installed for network security and four switches, network cables, proxy server and DHCP server are given to the network administrator for this purpose. Information system department is connected directly to the Internet.
Draw a network diagram for this scenario. Show all the IP addresses, network connectivity devices, network cables and servers clearly.
Use the following table as a help to allocate IP addresses (Use Fixed Length Subnet Mask (FLSM)).

Departments	Network address	Broadcast address	Subnet mask	Usable IP address range
Information System	*192.248.16.0*	*192.248.16.31*	*255.255.255.224*	*192.248.16.1 - 192.248.16.30*
Production				
Marketing				
Accounting				

(7)

(a) Consider the following scenario.

There will be many employees in a hospital. Employees of the hospital can be doctors, nurses and receptionist. Doctors will attend the patients. Doctor can be a trainee, permanent or a visiting doctor. A doctor can attend many patients. A patient is uniquely identified by patient_id. Each patient is assigned a room at a particular time duration. These rooms are governed by the nurses. It is uniquely identified by room_id. Records are kept for every patient. These records are maintained by receptionist. Each record is uniquely identified by the record_number. Bills are generated for both treatment and medicine provided to the patient.

Draw an EER diagram for this scenario. State any assumptions you made.

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(b) Consider the following "Customer" relational database table. This consists of details about some customers. Based on the given table, write down SQL statements for the followings.

CustomerID	CustomerName	ContactNo	City
C01	Nathiya	0212224243	Colombo
C02	Kamal	0777262533	Galle
C03	Jamuna	0765343431	Kandy
C04	Riswan	0118377372	Colombo
C05	Ranjith	0776353554	Jaffna

(i) Adding a customer's record whose CustomerID is 'C01' in the table.
(ii) Removing only a customer's record whose CustomerID is 'C05' in the table.
(iii) Obtaining all the details of customers in alphabetical order based on 'CustomerName'.

(8)

(a) Get the number of students (assume n) and input three marks for each of them from the user. Draw a flowchart to display total marks and average marks of each student while
(b) It is required to obtain the meter readings (last month reading and current month reading) of a set of customers (assume N) from the user and the electricity bill for the current month is to be calculated. Electricity charges are to be displayed based on the following conditions.

Conditions	Charge for units
First 50 units	*Fixed rate 500*
51 – 100 units	*20 rupees for a unit*
101 – 150 units	*30 rupees for a unit*
151 – 200 units	*50 rupees for a unit*
More than 200 units	*70 rupees for a unit*

(i) Draw a flowchart for this problem.
(ii) Write down a full Python program for the flowchart drawn in **(i)** above.

(9)
(a) Consider the following scenario.

A medical system that tracks patient heart rates is being replaced. A new system is attached while the old system is still working. The two systems are used during a short period to ensure the new system produces the exact same data as the old system.

(i) Which deployment technique is mostly appropriate for this purpose? Give a reason.
(ii) Write down one advantage of the deployment technique proposed by you in **(i)** above.
(iii) Write down one disadvantage of the deployment technique proposed by you in **(i)** above.

[see page no. 11

(b) Consider the following scenario.

A web-based information system is being implemented by the Ministry of Power to manage the country's temporary fuel shortage. This system is recommended for motorists in the country to register their vehicles via online and get a unique QR (Quick Response) code for that vehicle and get a weekly fuel allocation for the vehicles based on that QR code. Through the system, all the necessary facilities are provided for motorists to download the QR code and view their weekly fuel allocation and fuel station owners can also use this code on their mobile phones. Some of the functional and non-functional requirements of this system are given below.

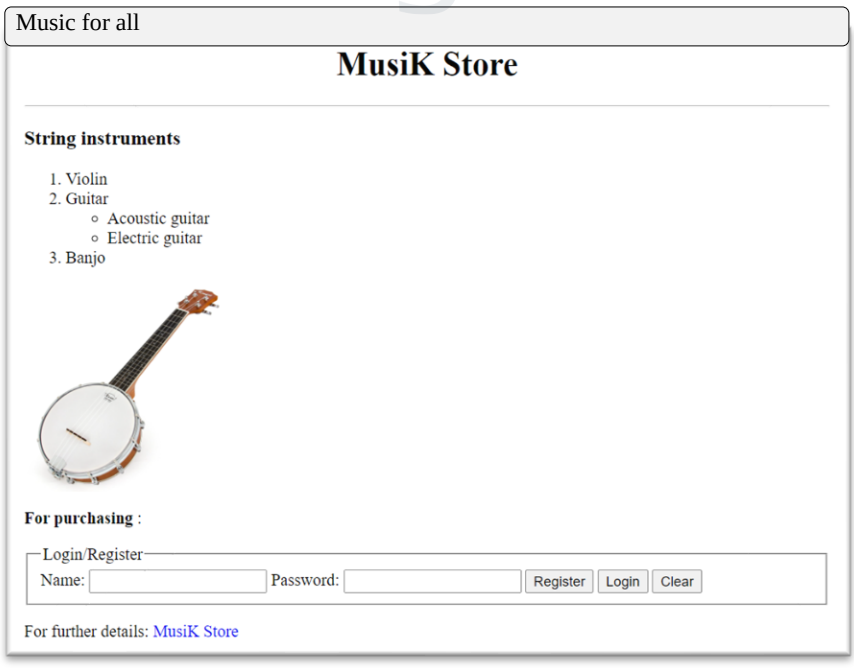
(A) System should be able to provide facilities for motorists to register details of vehicle via online.
(B) System should be able to provide facilities for motorists to search for their weekly fuel allocation
(C) Motorists shall be able to obtain their search details within a reasonable time limit.
(D) System should be able to use encryption to avoid registering by bots.
(E) System should be able to send confirmation details to specific contact details (e.g, cellphone).
(F) System should be able to have user friendly and efficient user interface.
(G) Motorists shall be able to use the system 24 hours a day.
(H) Motorists shall be able to edit/change therir registrations in the system.
Classify the user requirements of the web-based information system as functional or non-functional requirements separately mentioned above (it is sufficient to write only their labels).

(c)

(i) Briefly explain what acceptance testing is in the testing phase of software development and who performs it.

(ii) Compare and contrast with two characteristics of the agile software process model in comparison with the waterfall model.

(10) A webpage of a website of a shop which sells musical instruments is given below. Suppose that the name of the image is ‘banjo.jpg’ and URL of the hyperlink is URL http://www.musik.lk.



Write down a complete well-formed HTML coding to create this webpage.

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[end.