

අධ්‍යාපන පොදු සහතික රාජ (ලෙස පෙළ) විභාගය, 2014 අගෝස්තු කළම්පීප් පොතුන් තාත්ත්වය ප්‍රතිඵලි (ශ්‍රේෂ්ඨ නො) ප්‍රතිඵලි, 2014 ඉකෘත්ත් අධ්‍යාපන පොදු සහතික රාජ (ලෙස පෙළ) විභාගය, 2014 අගෝස්තු කළම්පීප් පොතුන් තාත්ත්වය ප්‍රතිඵලි (ශ්‍රේෂ්ඨ නො) ප්‍රතිඵලි, 2014 ඉකෘත්ත් General Certificate of Education (Adv. Level) Examination, August 2014

தொற்சுரூப் பண்ணிவேலை தொகுத்தொகுதி தகவல், தொடர்பாடல் தொழில்நுட்பவியல்
Information & Communication Technology

20 E I

பூர் தேவை
இரண்டு மணித்தியாலம்
Two hours

Instructions:

- * Answer all the questions.
 - * Write your **Index Number** in the space provided in the answer sheet.
 - * Instructions are given on the back of the answer sheet. Follow those carefully.
 - * In each of the questions 1 to 50, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct or most appropriate** and mark your response on the answer sheet with a cross (x) in accordance with the instructions given on the back of the answer sheet.
 - * Use of calculators is not allowed.

9. The Sri Lankan cricket team won the T-20 World Cup-2014 tournament. The Sri Lankan cricket fans had the highest value of this information when
 (1) the final match started.
 (2) Thisara Perera scored the winning run.
 (3) the captain Lasith Malinga received the trophy.
 (4) they saw the news on the newspapers.
 (5) they saw the cricket team at the Katunayaka Airport.

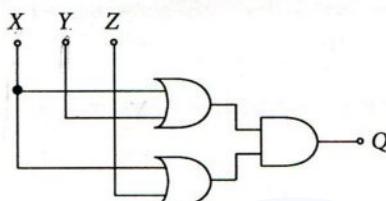
10. $4A6_{16} + 99_{10} =$

- (1) 615_{16} (2) 615_{10} (3) 509_{10} (4) 509_{16} (5) 659_{16}

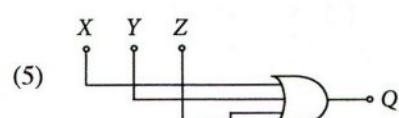
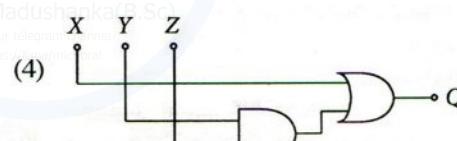
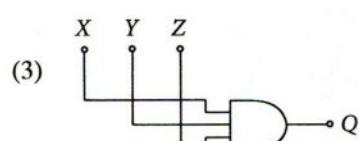
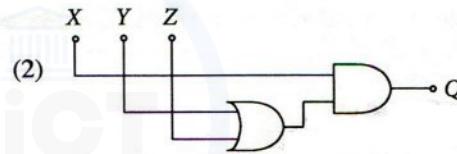
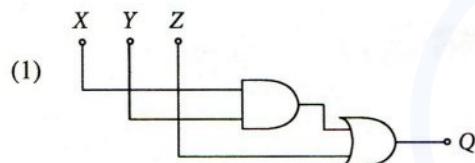
11. Representations of 5_{10} and -9_{10} in 8-bit Two's complement forms are

- (1) 00000101 and 11110111 respectively. (2) 11111011 and 11110111 respectively.
 (3) 00000101 and 10001001 respectively. (4) 00000101 and 11110110 respectively.
 (5) 11111011 and 11110110 respectively.

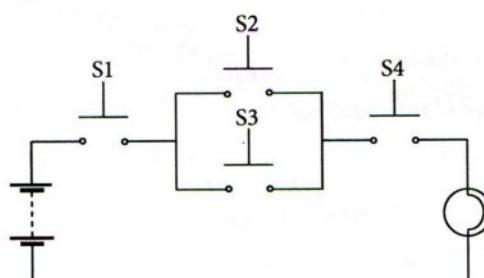
12. Consider the following logic circuit:



Which of the following circuit diagrams represents a simplified version of the above circuit?



13. Consider the following circuit with four push button switches namely: S1, S2, S3, and S4. These four switches can either be in pushed or released states which are represented by 1 and 0 respectively. (Note: In the circuit given below, all the switches are in released state having value 0.)



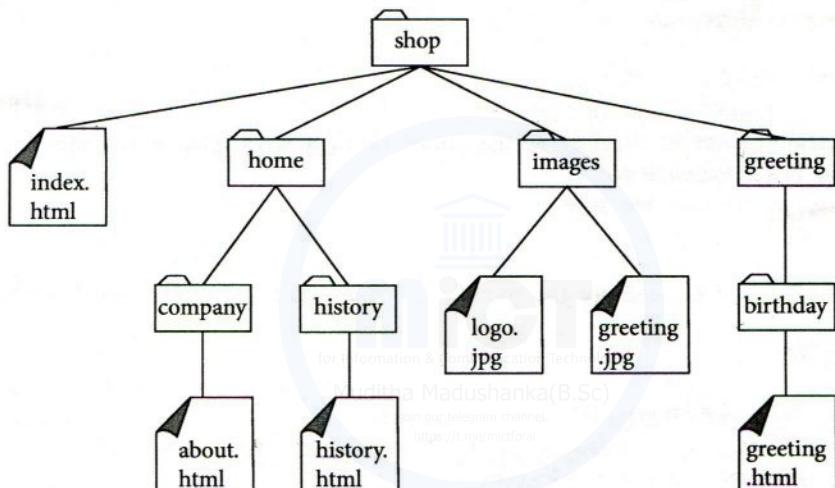
Which of the following Boolean expressions represents the function of the bulb, if the on state of the bulb is represented by the value 1?

- (1) $S1 + (S2 \cdot S3) + S4$ (2) $(S1 + S2) \cdot (S3 + S4)$ (3) $(S1 \cdot S2) + (S3 \cdot S4)$
 (4) $S1 \cdot S4 \cdot (S2 + S3)$ (5) $S2 + (S1 \cdot S4) + S3$

14. Which of the following has the fastest access speed?
 (1) Extended Memory (2) Register Memory (3) Flash Memory
 (4) Cache Memory (5) Virtual Memory
15. Which of the following is **not** a main function of an operating system?
 (1) Memory Management (2) Process Scheduling (3) File Handling
 (4) Virus Detection (5) User Interfacing
16. In an operating system, moving a process from the main memory to the secondary storage in order to bring in another process to the main memory is called
 (1) Demand Paging. (2) Context Switching. (3) Swapping.
 (4) Interrupting. (5) Scheduling.
17. The following element is a markup for including an image to an HTML document. The name of the source file of the image used is "arrow.jpg" which is in the same folder as the HTML document.

 Which of the following is the most suitable to fill the blank in the above element?
 (1) alt (2) src (3) scr (4) href (5) link

18. Consider the folder structure given below:



- Which of the followings is the correct markup to include in the index.html to link greeting.html document?
 (1) Greeting
 (2) Greeting
 (3) Greeting
 (4) Greeting
 (5) Greeting
19. Which of the followings is a client-side scripting language that is commonly used to add interactivity to web pages?
 (1) CSS (2) PHP (3) XML (4) HTML 2 (5) JavaScript
20. Consider the following HTML element:
 <input type = text size = 10/>
 The attribute 'size' on the above element refers to the
 (1) length of the text box in pixels.
 (2) maximum number of characters displayed in the text box.
 (3) maximum number of characters that can be typed into the text box.
 (4) font size of the text box.
 (5) number of lines displayed in the text box.

- 21 Facebook is a popular social network connecting millions of people with new members joining daily Which of the following statements is correct?
- Facebook plays a very important role in building and maintaining your family relationships.
 - Facebook is the only social network available today.
 - Privacy settings of Facebook assure the privacy of its users completely.
 - Publishing private information in Facebook has resulted in unfortunate incidents.
 - Real identity of a person is always guaranteed in Facebook.
22. Which of the following statements is true?
- Computer based learning is a teacher oriented learning technique.
 - Skype is a famous video conferencing technique.
 - Virtual Private Network (VPN) provides a medium for telecommuting.
 - Conducting offline examinations can be considered as computer aided assessments.
 - Microsoft Power Point is Free and Open Source Software (FOSS) for computer based presentations.
23. Computers attached to a LAN use the default gateway connected to the same network
- to translate the domain names to IP addresses.
 - to forward IP packets when they do not know any specific route to the destination.
 - as the firewall for the network.
 - to send all the data packets to other computers in the same LAN
 - to assign IP address to a computer on the LAN
24. Which of the following statements is true?
- www.ebay.com is an example for C2C.
 - When the government renders its services to the public through www then it is called B2C.
 - www.wikipedia.com is an example for C2B.
 - www.amazon.com is an example for B2E.
 - Facebook groups are examples for E2C.
25. The command that can be used to measure the round trip propagation delay between two computers on the Internet is
- ping.
 - ifconfig.
 - ssh.
 - ftp.
 - telnet.
26. In the OSI seven layer reference model, IP protocol maps to the _____ layer.
Which of the following is most appropriate to fill the blank in the above statement?
- application
 - session
 - transport
 - network
 - physical
27. The function of the DHCP server in an IP network is to
- translate domain names to IP addresses.
 - cache the web pages.
 - dynamically allocate IP addresses.
 - filter IP packets.
 - provide security
28. Which of the following is a valid subnet mask?
- 255.255.255.192
 - 255.0.255.0
 - 256.255.255.64
 - 255.256.255.96
 - 0.0.0.255
29. The ping command indicates that there is a 5% packet loss between the computers X and Y. There is an FTP server running on Y. A file is downloaded to X from Y using FTP protocol. Which of the following is the most appropriate statement regarding this file download?
- The downloaded file has exactly 5% of the data missing.
 - The downloaded file has more than 5% of the data missing.
 - The downloaded file has 5% of data in a different order than the original file.
 - The downloaded file has the data in exactly the same order as the original file.
 - FTP protocol cannot run on a network connection with errors.
30. Which of the following relations is in the 3rd normal form?
- student(studentIndexNo, name, parentName)
 - sport(sportId, sportName, teacherName, teacherId)
 - teacher(teacherId, teacherName, telephoneNumber, subjectName, subjectId)
 - book(ISBN, title)
 - patient(patientId, patientName, ward, wardId)

- Consider the following three tables in a relational database to answer questions 31 to 34. Assume that a subject has only one paper for an examination.

subject

| subjectId | title |
|-----------|----------------------------|
| SUB001 | Information and Technology |
| SUB002 | Chemistry |
| SUB003 | Physics |

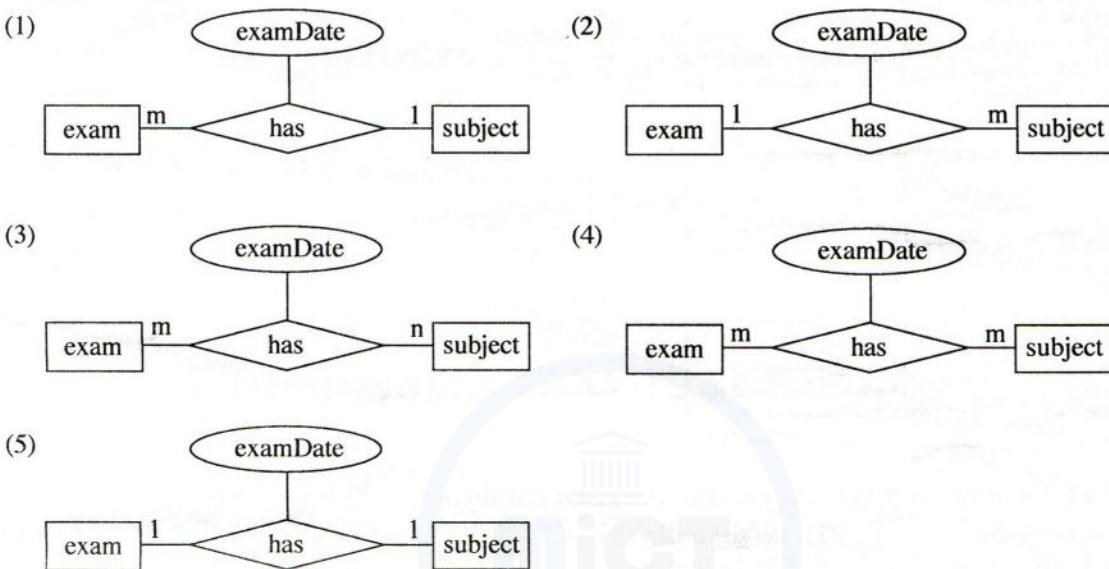
exam

| examId | name |
|---------------|-------------|
| EXAM001 | GCE OL |
| EXAM002 | GCE AL |

examSubject

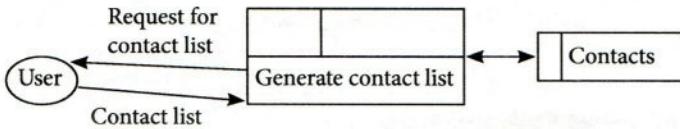
| examId | subjectId | examDate |
|---------|-----------|------------|
| EXAM001 | SUB001 | 2014.12.12 |
| EXAM002 | SUB001 | 2014.8.21 |
| EXAM002 | SUB002 | 2014.8.21 |
| EXAM002 | SUB003 | 2014.8.21 |

- 31 Which of the following is the most suitable Entity Relationship (ER) diagram to represent the above relational database tables?

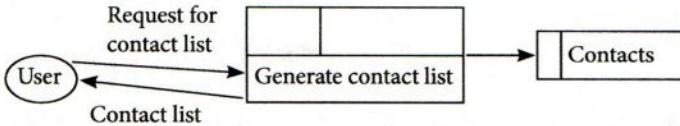


36. Which of the following segment of a Data Flow Diagram best represents the process of getting the contact list of a mobile phone?

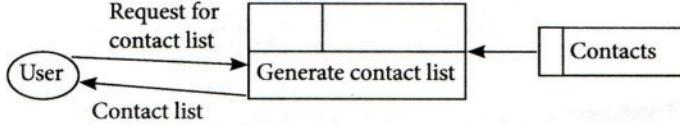
- (1) Request for contact list



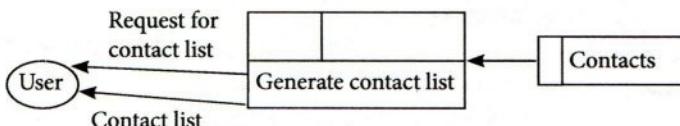
- (2) Request for contact list



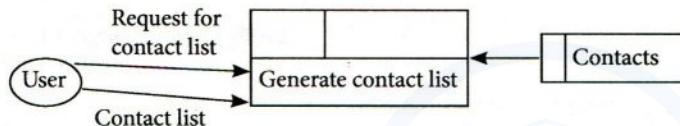
- (3) Request for contact list



- (4) Request for contact list



- (5) Request for contact list



37 Which of the following is a syntactically correct Python function?

- (1) def isLarger(a,b):
 return a > b

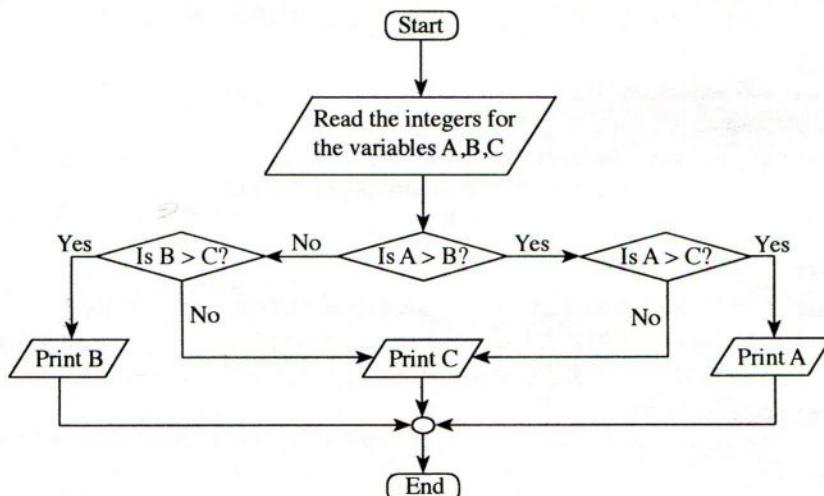
- (2) def isLarger(a,b):
 return a > b

- (3) def isLarger(a,b)
 return a > b

- (4) function isLarger(a,b):
 return a > b

- (5) function isLarger(a,b)
 if(a > b)
 return a
 else
 return b

● Use the following flowchart to answer questions 38 and 39.



38. If a user input 20, 27, 18 for the variables, A, B, C respectively the output will be

- (1) 18

- (2) 20

- (3) 27

- (4) 20, 27

- (5) 27, 18

39. Which of the following Python programs correctly implements the above flowchart?

```
(1) A = int(input("Enter a value for A."))
B = int(input("Enter a value for B:"))
C = int(input("Enter a value for C:"))

if (A > B):
    if(A > C):
        print(A)
    else:
        if(B > C):
            print(B)
        else:
            print(C)
```

(2) A = int(input("Enter a value for A."))
B = int(input("Enter a value for B:"))
C = int(input("Enter a value for C:"))
if (A > B):
 if(A > C):
 print(A)
 else:
 print(C)
else:
 if(B > C):
 print(B)

```
(3) A = int(input("Enter a value for A."))
B = int(input("Enter a value for B:"))
C = int(input("Enter a value for C:"))

if (A > B):
    if(A > C):
        print(A)
    else:
        print(C)
else:
    if(B > C):
        print(B)
    else:
        print(C)
```

```
(4) A = int(input("Enter a value for A."))
B = int(input("Enter a value for B:"))
C = int(input("Enter a value for C:"))
if (A > B):
    if(A > C):
        print(C)
    else:
        print(A)
else:
    if(B > C):
        print(C)
    else:
        print(B)
```

(5) A = int(input("Enter a value for A."))
B = int(input("Enter a value for B:"))
C = int(input("Enter a value for C:"))
if (A > B):
 if(A > C):
 print(A)
 else:
 print(C)
else:
 if(B > C):
 print(C)
 else:
 print(B)

40. What will be the output when the following Python code is executed?

```
a = ['a', 2, [3, 'b', 4], [6, "abc", 9], 8]
print(a[2][2])
```


41 What is the value of variable z after executing the Python statement `z = 1 == 2`?

- What is the value of variable `i` after executing the Python statement `i = 1`?

42. Which of the following Python expressions shows the correct evaluation order of the Python expression $10 - 4 * 3 / 2 - 5^2$

- $$(1) (((10 - 4) * 3)/2) \quad 5 \qquad (2) ((10 - (4 * 3))/2) \quad 5 \qquad (3) 10 - (4 * ((3/2) - 5))$$

$$(4) 10 - ((4 * (3/2)) - 5) \qquad (5) (10 - ((4 * 3)/2)) \quad 5$$

43. Consider the following statements on Static Random Access Memory (SRAM):

- A SRAM needs periodic refreshing
 - B It is used for Cache memory
 - C Registers are made of SRAMs

C Registers are made of SRAMs

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

44. Consider the following HTML style rules:

- A body {color: red;}
- B h1 {color: red;}
- C p {color: red;}
- h1 {color: red;}
- D p, h1 {color: red;}

Which of the above rules will display h1 elements and all the paragraphs of the following document in red?

```
<body>
    <h1>Trees</h1>
    <p>Coconut tree</p>
    <p>Rubber tree</p>
    <h1>Flowers</h1>
    <h2>Rose</h2>
</body>
```

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

45. Which of the following systems should always be based on Artificial Intelligence?

- A Expert Systems
- B Enterprise Resource Planning (ERP) Systems
- C Multi-Agent Systems
- D Geographical Information Systems

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

46. Consider the following statements about an automated system:

- A Human intervention is not required or minimally required.
- B All the operations of the machine are controlled by the micro chip installed in the machine.
- C A system that processes daily banking transactions can be considered as an automated system.

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

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

47. Consider the following statements regarding the requirements of a Bank ATM:

- A A customer shall be able to inquire his/her bank balance.
- B A customer should be able to deposit money through ATM.
- C Maximum withdrawal amount per day is Rs. 20,000.

Which of the above requirements is/are functional requirement(s) of the ATM?

- (1) A only
- (2) B only
- (3) C only
- (4) A and B only
- (5) A and C only

48. Consider the following systems:

- A Human blood circulatory system
- B Human digestive system
- C Human nervous system

The system(s) that can be considered as open system(s) is/are

- (1) A only
- (2) B only
- (3) C only
- (4) A and B only
- (5) A and C only

49. Consider the following statements about Software Agents:

- A A software agent is capable of autonomous actions in order to meet its design objectives.
- B A software agent is capable of user-directed actions in order to meet users' objectives.
- C A multi-agent system is composed of set of interacting agents.

Which of the above statements is/are true?

- (1) A only
- (2) B only
- (3) C only
- (4) A and B only
- (5) A and C only

50. Consider the following statements about syntax or semantic errors in Python programming language:

- A A program with syntax errors will not run to the end of the program.
- B A program with only semantic errors will not run to its end.
- C Syntax errors in programs are also called logical errors.
- D Programs with semantic errors may not produce correct outputs for some inputs.

Which of the following statements is correct?

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

PART A – Structured Essay
Answer all four questions on this paper itself

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column

- 1 (a) Consider the definition list given below rendered by a web browser:

CPU

Central Processing Unit

ROM

Read Only Memory

Complete the following HTML code segment to display the above list.

```
<dl>
    <.....>CPU<.....>
    <.....>Central Processing Unit<.....>
    <.....>ROM<.....>
    <.....>Read Only Memory<.....>
</dl>
```

- (b) Write the outputs of the following HTML code segments when rendered by a web browser.

(i) <abc>Greetings!</abc>

(ii) </u>Greetings!<u>

- (c) Consider the following output with check boxes rendered by a web browser:

Programming Languages Used:

C Java Python

Complete the following HTML code segment to render the above output.

```
<form method = "get" action ="">
```

```
.....
```

```
.....
```

```
.....
```

```
.....
```

</form>

3. You are given the following two tables in a relational database.

house

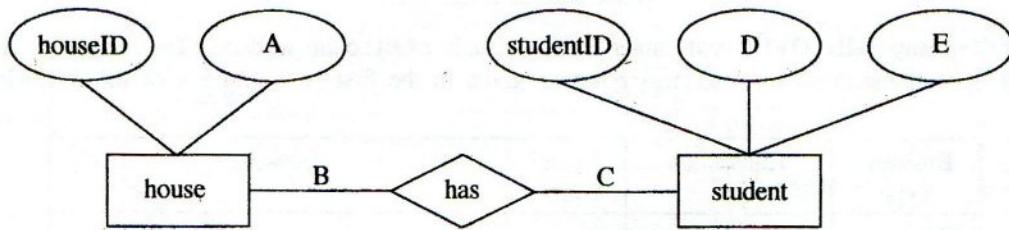
| houseID | name |
|---------|---------|
| HS1 | Gamunu |
| HS2 | Tissa |
| HS3 | Wijaya |
| HS4 | Parakum |

student

| studentID | name | grade | houseID |
|-----------|---------|-------|---------|
| STU001 | Ranjith | 13 | HS1 |
| STU002 | Gopy | 12 | HS1 |
| STU003 | Vipula | 12 | HS2 |
| STU004 | Hakeem | 11 | HS3 |

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write
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column.

- (a) The above tables were created by converting the ER diagram given below.



Fill in the following blanks with the suitable labels or necessary information for the A, B, C, D and E shown in the ER diagram.

A -

B -

C -

D -

E -

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Muditha Madushanka(B.Sc)

- (b) State whether the relationship between the tables student and house, is one-to-one, one-to-many, or many-to-many. Justify your answer using suitable data from the above tables.

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column

(c) Write the output of the following SQL statements based on the above tables, if any, otherwise state the error.

(i) select * from student where houseID = 'HS3'

(ii) select studentID, houseID, name from student, house

4. (a) The memory of a computer system is byte addressable and has a maximum usable size of 4GB. What is the minimum width of its address bus in bits? Show all your workings clearly.



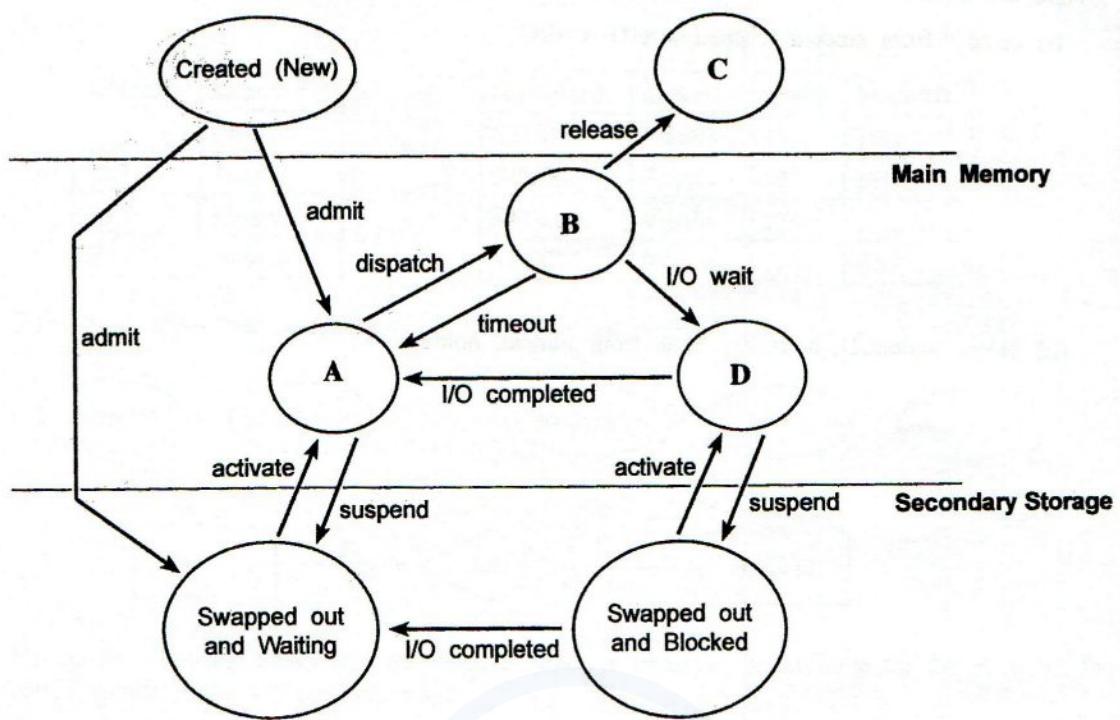
(b) Consider the following statement regarding operating systems:

"Process is another name for a program"

Do you agree with this statement? (yes/no) Give a reason.

(c) Consider the following process state transition diagram in an operating system:

Process State Transition Diagram



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Fill in the blanks in the table given below by providing most suitable terms for the labels A, B, C and D.

| Label | Term |
|-------|--------------------------|
| A | Muditha Madushanka(B.Sc) |
| B | |
| C | |
| D | |

* *

ලංකා රිජය දෙපර්ටමේන්තුව හි ලංකා කිසළු ආදාළත්තාවෙහිවැඩාර්ථකීයව උ මා එහා දෙපාර්තමේන්තුව උ මා එහා දෙපාර්තමේන්තු නිලධාරකාන් පරිශාස්ත තිබෙනු කාමා නිලධාරකාන් පරිශාස්ත තිබෙනු කාමා නිලධාරකාන් පරිශාස්ත තිබෙනු කාමා Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka නිලධාරකාන් පරිශාස්ත තිබෙනු කාමා Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka

Department of Examinations, Sri Lanka

අධ්‍යාපන පොදු සහතික රඟ (අධ්‍යක්ෂ පෙළ) විභාගය, 2014 අභ්‍යන්තරීය
කළම්පිය පොත්ත් තුරාතුරුප පත්තිර (ඉ යෝ තු)ප පරි සෑ, 2014 ඉකළන්න
General Certificate of Education (Adv. Level) Examination, August 2014

தொற்குரை மூலம் தொகையிலிருந்து தொகை விடையீடு

20 E II

Part B

* Answer any four questions only.

- 1 An alarm system has been designed to detect break-ins by using three detectors. They are a motion detector, a glass break detector and a blackout detector. A detector can either be active (sends the logical value 1) or inactive (sends the logical value 0). The system automatically detects a break-in and triggers the alarm (sends the logical value 1) only when all the three detectors are simultaneously active, or the blackout detector and anyone of the remaining detectors are active.

(a) Construct a truth table to represent the functionality of the above alarm system.

(b) (i) Derive the Boolean expression to represent the truth table constructed in section (a) above.
(ii) Simplify the Boolean expression obtained in section (b) (i) above, using Boolean algebra. Clearly show all the workings and Boolean algebraic rules used for this simplification.
(iii) Construct the logic circuit for the simplified Boolean expression obtained in section (b) (ii) above.

(c) The analysis of the past incidents where the alarm triggered reveals that break-in attempts have been made only during blackouts. Do you agree with the above statement? Justify your answer.

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2. (a) Draw a diagram depicting the seven layers of the OSI reference model.

(b) You have received an email supposedly from the administrator of your email system notifying that your email account is about to be closed soon. It requests you to click on a link in the email and enter your current user name and the password if you want to continue using your email account. What is the main threat to the security if you agree with this request?

(c) Draw diagrams to depict the following LAN topologies.
(i) Bus
(ii) Star
(iii) Ring

(d) A new tool MRTT was used to measure the round trip time for data packets on the Internet between two machines. One machine is at the location X and the other one is at Y. The MRTT reported a round trip time between X and Y as 8 ms. The straight-line-distance between point X and point Y is 3 000 km and the maximum speed of light is 300 000 km/s. Based on the above information, can this tool MRTT be relied upon? Justify your answer.

3. Consider the following employee evaluation process of a software development company to answer the questions given below.

A software development company has 600 employees. The company manually evaluates each employee's performance at the end of each year. These performance results are used to decide employees' salary increments for the next year. In this process, each employee is evaluated based on several performance indicators listed in an evaluation form and marks for these indicators are given by his/her superiors. The evaluation process consumes significant amount of each employee's working time. Once the marks are gathered, Human Resource (HR) manager takes around two months to compile them to prepare a report. A committee comprises of two executives from the HR department and an expert from the Finance department are appointed to decide the salary increments of each employee. This committee makes their decision based on the HR manager's report and the special report given by the finance expert in this committee. The finance expert uses his experiences of the past evaluation process in addition to the organizational guidelines to prepare his special report. This

finance expert usually takes around three months to make his recommendations to the committee. This process delays the salary increments of the employees and makes them unhappy. The employees have requested the management to expedite this process and give them the increment in-time.

The company has decided to computerize this year-end employee evaluation process as an online system. The proposed system functions as follows: Only during the evaluation period, employees are allowed to login to the online evaluation system. Each employee is required to log into the system and select a subordinate to evaluate. Then the system requests to provide marks in the evaluation form of the selected employee and submit it. At the end of the evaluation period, the system automatically compiles the data, generates a report and forwards it to the appointed committee.

- (a) State **two** key reasons, that make the company to introduce online computerized system.
 - (b) Company thinks that an Artificial Intelligence based system would reduce the time taken to this process. Do you agree? Justify your answer.
 - (c) Do you consider the service provided by the company through this system to its employee as B2E? Justify your answer.
 - (d) Company decides to invite an outside expert to the committee. State one negative impact of this decision.
4. (a) Explain what is done by the Python interpreter when executing the following statements. You should state the types of the variables involved.
- (i) `x = input("Enter a number")`
 - (ii) `infile = open("myfile.txt","r")`
 - (iii) `a = "a,b,c".split(",")`
- (b) Factorial of a positive integer n is defined as $n \times (n-1) \times (n-2) \times \dots \times 3 \times 2 \times 1$.
- (i) Propose an algorithm by using a flowchart to print the factorial of a given positive integer n .
 - (ii) Write a Python function to implement your flowchart.
5. Draw an Entity Relationship (ER) diagram to represent the scenario given below. In your diagram the attributes and the primary keys should be clearly indicated. Clearly state your assumptions, if any.

The EST University has three faculties: Education, Science, and Information Technology. Each faculty can offer one or more degree programs. The Faculty of Education and the Faculty of Science offer Bachelor of Education and Bachelor of Science degree programs respectively. However, the Faculty of Information Technology offers two degree programs: Bachelor of Science in Information Technology and Bachelor of Science in Software Engineering. At the time of the registration, students should pay the full degree program fee which may differ from one degree program to another. A student can enrol in only one degree program at a time. A degree program has two types of course units: compulsory and optional. A course unit can be available in more than one degree program. EST university has many lecturers. A lecturer can be assigned to one or more course units. A course unit can be assigned to one or more lecturers. Number of hours allocated for a course unit is distributed among the assigned lecturers when more than one lecturer is assigned to a course unit. Each faculty, degree program, course unit, lecturer, and student are uniquely identified by 'facultyID', 'degreeID', 'courseID', 'lecturerID' and 'studentID' respectively.

6. A university in Sri Lanka has around 8000 students. It has only one library. Currently, three library assistants provide all the library services such as lending, returns and answering the queries from the students. It is observed that about 90% of the students use the library facilities from 7:00 a.m. to 9:00 a.m., 12 noon to 1:00 p.m. and 6:00 p.m. to 7:00 p.m. Long queues of students can be seen in front of the three counters manned by the three library assistants during those hours. This situation has led to students' unrest since they have to waste their time in long queues. Library assistants are also not happy due to heavy work load and sometimes this has lead them to make mistakes.

- (a) Identify and state **three** functional requirements associated with the above university library system.
- (b) Identify and state **two** non-functional requirements related to the above system with justifications.
- (c) Propose **two** different computerized solutions and **one** non computer-based solution to solve the problems in the university library system.