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கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2014 ஓகஸ்ற
General Certificate of Education (Adv. Level) Examination, August 2014

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தகவல், தொடர்பாடல் தொழினுட்பவியல்	**II**	20 E II	மூன்று மணித்தியாலம்
Information & Communication Technology	**II**		***Three hours***

Index No. : ....

Important :

* This paper consists of **08** pages.

* This question paper comprises of two parts, Part **A** and Part **B**. The time allotted for **both parts** is **three hours**

* Use of calculators is **not** allowed.

Part A - Structured Essay : (pages 2 - 6)

*Answer **all** the questions on this paper itself Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and that extensive answers are not expected.*

Part B - Essay : (pages 7 - 8)

* This part contains **six** questions, of which, **four** are to be answered. Use the papers supplied for this purpose.

* At the end of the time allotted for this paper, tie the **two parts together** so that Part **A** is **on top** of Part **B** before handing them over to the Supervisor

* You are permitted to remove **only** Part **B** of the question paper from the Examination Hall.

For Examiner's Use Only

For the Second Paper		
Part	**Question Nos.**	**Marks**
A	1	
	2	
	3	
	4	
B	1	
	2	
	3	
	4	
	5	
	6	
Total		

Final Marks

In numbers	
In words	

Code Numbers

Marking Examiner 1	
Marking Examiner 2	
Marks checked by	
Supervised by	

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

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>
```
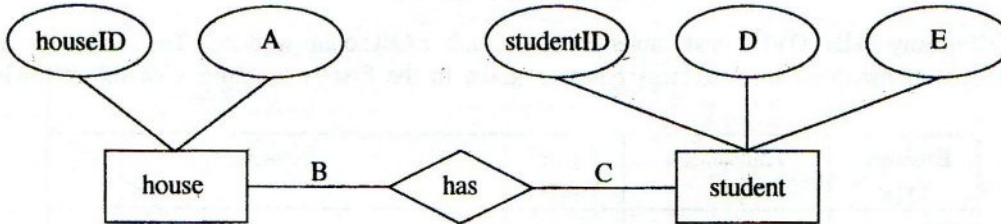
[see page three

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

(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 - ....

(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.

(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.
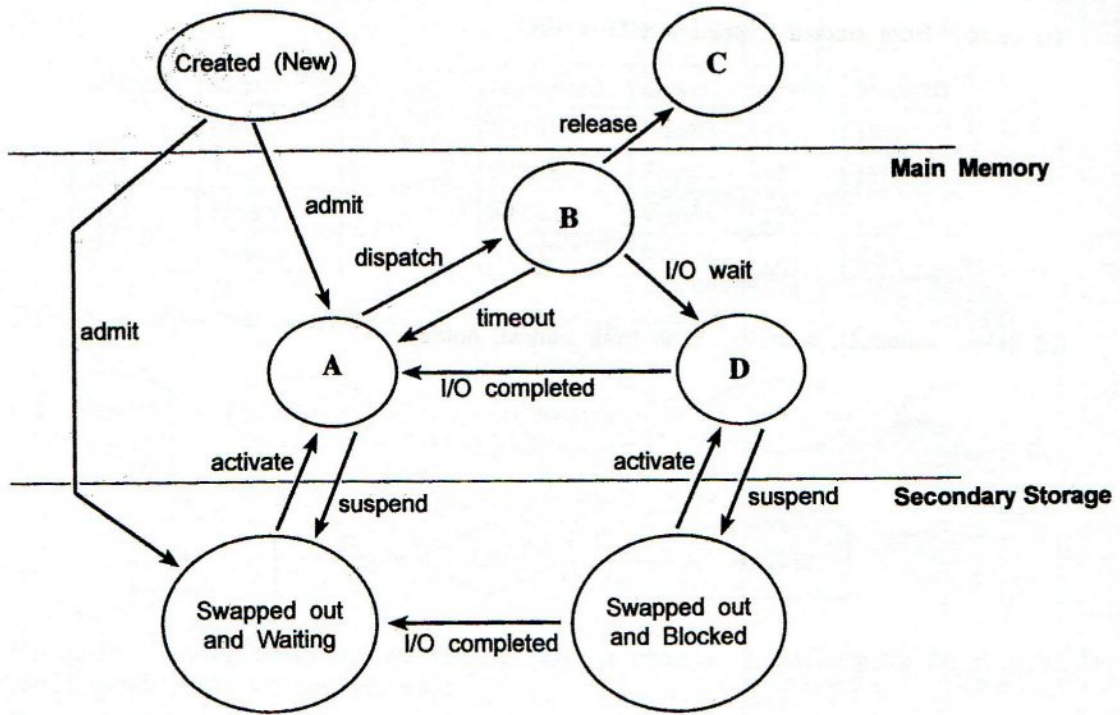
(b) Consider the following statement regarding operating systems:

"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

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	
B	
C	
D	

✴ ✴

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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.

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 logged 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 $n \times (n-1) \times (n-2) \times \ldots \ldots \times 3 \times 2 \times 1$.

    (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 8 000 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.

* * *