බණ්ඩාරනායක විද්‍යාලය, ගම්පහ
Bandaranayake college, Gampaha

අධ්‍යාපන පොදු සහතික පත්‍ර(උසස් පෙළ) විභාගය - **13 වසර : 1 වන වාරය - 2024**
General Certificate of Education (A/L) Examination - **Grade 13 : Term 1 - 2024**

| තොරතුරු හා සන්නිවේදන තාක්ෂණය II
Information & Communication Technology II | 20 | E | II | පැය තුනයි
Three Hours |

Paper II

Part A- Structured Essay

Answer all four questions on this paper itself.

01) Consider the following scenario about attendance management of Bandaranayake college Gampaha.

   a) All teachers should mark their attendance by putting the index finger on the finger print machine. Then system will record the time and the teacher number in the system. After day clerk can get attendance report, and delete the duplicate teacher records from it.

  I. Write the steps of life cycle of data and an example for each step only from above scenario.(3 marks)

Step	Example

  II. Write two devices can be used to collect data with semi-automated methods. .(1 mark)

…………………………………………….. ……………………………………………..

  III. Define the term digital bridge. .(1 mark)

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  IV. Compare and contrast about terms privacy and piracy. .(2 marks)

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  V. Write the main functions of the computers invented in the mechanical era given below. .(3 marks)

    a) Pascaline machine : …………………………………………………………………………

    b) Stepped recorner : …………………………………………………………………………

    c) Analytical Engine : …………………………………………………………………………

02)

a) Find the binary answer of given decimal number (**59.6875**) below. (3 marks)

b) Fine the 2's complement values of given numbers in 8-bit system. . (2 marks)

I. (-52)	II. (+47)

c) Solve the problems given below as binary numbers, by clearly mentioning the steps. (2 marks)

I. 101011+1101+1110+111	II. 10000001 - 1011110

d) Find the answers for given decimal numbers by applying bitwise logics given below. (3 marks)

I. 28 and 43	II. 19 or 38	III. 25 xor 47

03) Consider the seven-state process transition diagram in process management of operating system.

a) Write the responsible schedular for tasks given below. (3 marks)

    I.   Dispatch the processes for running in the processor: ……………………………………….

    II.   Admit processes to the ready queue: ………………………………………

    III.   Transfer processes to the virtual memory if need: …………………………………..

b) Write three information stored in the PCB of each process. (1.5 marks)

    I.   ……………………………………………………………………………………………………

    II.   ……………………………………………………………………………………………………

    III.   ……………………………………………………………………………………………………

c) It is very important to maintain a spooling buffer in device management of operating system. Briefly explain the importance of maintain a spooling buffer. (1.5 marks)

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d) Complete the given table by considering the OSI reference model of networking. (4 marks)

Layer	Data Unit	Protocol	Main function
Data link			
Network			
Transport			
Application			

04) Kapuru is a software developer who planned to develop a student management system for his tution master and do the following things.

First of all, he would evaluate if the system can effectively integrate with existing hardware (e.g., biometric scanners, barcode readers) and also Institute will be able to invest for the system which he going to develop. Then he evaluates that existing employees (tikka's) can use the new system for mark the attendance of students, and the Institute can survive without disturbances from the new system he proposed.

a) Write four types of feasibilities he studied and example for each type only from the scenario. (4 marks)

Feasibility	Example

b) Differentiate the white box testing and black box testing strategies with three identical characteristics. .(3 marks)

White box testing	Black box testing
………………………………………………...	………………………………………………..……..
………………………………………………...	………………………………………………..……..
………………………………………………...	………………………………………………..……..

c) Kapuru planned to handover the software in different methods. Write the most suitable deployment method for given occasions below. .(1.5 marks)

    I.   Install the new software and run it while removing the old software: ………………………

    II.   Install the new software for only mark the attendance initially, later install the modules for class fees management and allow access to recordings by each steps. : ……………………..

    III.   Install the new software for only mark the attendance initially, later install all other modules at once.: ………………………………

d) Write two advantages and one disadvantage of using COTs for the purpose, instead of using Kapuru's software. .(1.5 marks)

    I.   Advantages:

………………………………………………………………………….

………………………………………………………………………….

………………………………………………………………………….

    II.   Disadvantage:

………………………………………………………………………….

………………………………………………………………………….

Part-B

Answer only for selected 4 questions only.

05)

a) Below diagram shows the logic circuit of an automated hand sanitizer spraying machine invented by a school student for keeping hands clean.

- A is a sensor of detecting hands in it, and B is a mechanical switch, which can be activated by foot when the hand recognizing sensor A is working or not. Another sensor C is allocated to identify the sanitizer level in the container.
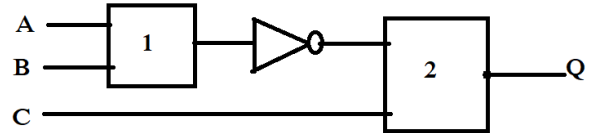
- Sensor A is activated (1) as soon as a hand is pointed to it. The sensor C is activated (1) when hand sanitizer is not in the container.

- Hand sanitizer is sprayed (Q=1) if sanitizer is available in the container and only when a hand is closer or when the mechanical switch is activated.

      I.   Complete the truth table for the function of Q. .(4 marks)

     II.   Write the names of logic gates need to complete the circuit given above. .(2 marks)

   III.   Simplify the SOP expression you got from the truth table only using K-Map .(3 marks)

   IV.   Draw the logic circuit for simplified expression using only NAND gates. .(3 marks)

b) Simplify the Boolean expression given below using Boolean rules only. .(3 marks)

      I. $Z= (P+Q+R) . (P'+Q'+R') . (P+Q'+R) . (P+Q'+R')$

06) Suppose an IT Service company owns a computer which has the 192.168.20.138/26 IP address. Assume that the IT Service provider wants to create four subnets namely, Subnet A(5 PCs), Subnet B (8 PCs), Subnet C(6 PCs) and Subnet D(15 PCs) from the address block with each subnet having the number of PCs given above within the brackets.

a) Write the IP address given above in binary notation. .(1 marks)

b) Write the subnet mask of IP address given above in binary notation. .(1 marks)

c) Find the network address of above IP address belongs. .(3 marks)

d) Once subnetting is done, fill in the following table. .(5 marks)

Subnet	Subnet Mask	Net IP	Broadcast IP	1st Host IP	Last host IP
Subnet A					
Subnet B					
Subnet C					
Subnet D					

e) Draw the NRZ-L, NRZ-I, Manchester encoding digital signal for bit pattern given below. (3 marks)

      I.   101110010

f) Write 2 disadvantages of Bus topology compared to the star topology. (2 marks).

07)
a) Consider the scenario about processing leaving certificate of a certain school in sri lanka. Draw the level 1 dfd for represent the data flow of given scenario.

When A student decides to get leaving certificate from the school, student send request to the clerk in the administrative office in the school. Then clerk send the google form link to fill the student data. student fill the data and submit it. clerk download the google sheet containing student data and send it to the database named application_data.

Upon receiving the certificate request, the clerk verify the student's ,basic information with the school admissionBook,and send request to confirm following to relevant persons.Extra curicular activities from assistant principal(assistant principal check the performanceRecord book and confirm),Sports activities from sports in charge (sports incharge check the SportRecord book and confirm),Library clearance confirmation from librarian (librarian check the lending_book database in the computer and confirm).

After verifying the student's information, the clerk proceeds to generate the school leaving certificate using predefined templates stored in the templates database.

Once the certificate is printed, it undergoes a thorough review by the vice principal to ensure completeness and accuracy. They carefully check for any errors in the provided information and make necessary corrections. Then vice principal put the signature to completed certificate and give it to the clerk. Clerk give the certificate to the student and Copy of the leaving certificate saved in the given_certificates copy file.

b) Name the labels of functional requirements from given list below.
    I. Student should be able to mention extra-curricular activities in the application.
    II. Student should be able to mention at least 3 sports participated in the application.
    III. System should be work on weekends also.
    IV. assistant principal should be able to mark extra-curricular activities by putting comments.
    V. System should be able to record number of leaving certificates issued.
    VI. Student should be able to request more than one copy of certificates from the system.

08) A computer uses 32-bit virtual addresses. This computer has a 512 MB physical memory and a 4 KB page size. Consider that memory is byte addressable.
a) Find the number of pages created for a particular process. (2 marks)
  b) How many bits needed to represent the page number and frame number. (2 marks)

c) Calculate the number of bits needed to represent the page offset. (2 marks)

d) Assume that virtual address 8195 need to access the processor.

    I.   Find the page number that virtual address contains? (2 marks)

   II.   If the page containing virtual address 8195 mapped to frame number 5, write the physical address in binary format. (3 marks)

e) Assume that the pie.py file is stored on blocks in a disk that uses a File Allocation Table (FAT) to manage its storage given below. The disk uses 4 KB blocks.

Block	420	421	422	423	424	425	426	427	428
Next block	423	425	-1	422	421	420			

    I.   Write down the directory entry number for the pie.py file. (1 mark)

   II.   Find the capacity of the pie.py file on the disc (1 mark)

  III.   User make some edit to the pie.py which leads to increase the file size by 12 KB. Mention the necessary changes of the FAT may be happened (Use the structure given above). (2 marks)

09)

a) Student requested to design an algorithm(**Flow chart or Pseudo code**) to get the following output according to the given input and conditions.

Initially input the number of students in the class and then input the weight(kg) and height(m). then calculate the BMI of the student and if BMI is less than 18.5, display "underweight range", and If BMI is 18.5 to 24.9, display "Healthy Weight " and , If BMI is greater than 25.0 display " overweight range", and count the number of students with each category and display the counts at the end.(8 marks)

b) Write a python program to input NIC number of any person and output the gender and age of the person to present as following format. (7 marks)

    I.   Welcome student

   II.   Your age is 18 years old.

  III.   Your gender is Male
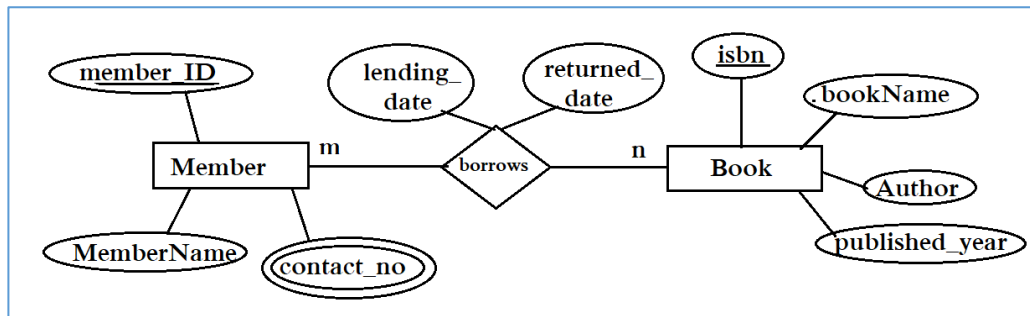
NIC->200612300124
              Birth year gender

If gender value > 500 then female

If gender value < 500 then male

10)

a) Consider the ER diagram segment of a library database management system given below.

I. Write the relational schema for above ER diagram segment. (4 marks)

II. Write SQL statement to build the Book table with primary key. (3 marks)

b) Consider the scenario given below. Draw the ER diagram to represent the database system. (8 marks)

Shasanarakshaka Balamandalaya has decided to maintain a database to store students details of Buddhist damma schools belongs to that Shasanarakshaka Balamandalaya. In this case Shasanarakshaka Balamandalaya has 35 damma schools.Each damma school uniquely identified by censusNo. Damma school has name, templeName, address consist of street and town, and at least two contact numbers.

Each damma school has students which student may belongs to only one damma school. Student may has indexNo, name, dateOfBirth, class and one contact number. There are several competitions organized by Shasanarakshaka Balamandalaya. Each competition has unique competition_No , competitionName, and description.

Competitions have created events for each year according to the ageGroup. Each event uniquely identified by competition_No. for each event will select three places (winner's indexno). One competition may has more than one events while one event belongs to more than one competition. event details are maintained only for each year. Student can participate only one event per each year, but each event may have maximum 35 students. however student can join same event in different years.