G.C.E AL ICT 2020

General Certificate of Education (Adv. Level) Examination, August 2016

Information & Communication Technology II | ***Three hours*** | **20** | **E** | **II**

Use the additional reading time to go through question paper, select the question and decide on the questions that you give priority in answering. MODDEL Paper 01 2020 Part II

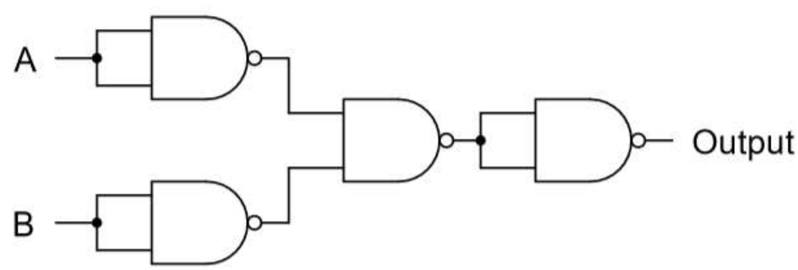
Part B –Essay

Answer ***only*** *four questions on this paper itself.*

1.

a) Briefly explain why does logic gate designer use the NAND and NOR gates for the circuit implementation instead of basic gates like AND, OR and NOT.

b) Simplify this logic gate circuit and find equivalent logic operation, which uses NAND gates to accomplish a certain logic function:



c) A half adder is a type of adder, an electronic circuit that performs the addition of numbers. The half adder is able to add two single binary digits and provide the output plus a carry value. It has two inputs, called A and B, and two outputs S (sum) and C (carry).

i. Draw the truth table and logic circuit diagram for the half adder.

ii. Represents the sum and carry of the half adder using only NAND or NOR gates and draw the logic gates.

2. Consider the following university system to design the network for the student and staff of the faculty of information technology.

   Assume that the faculty of information technology has the three departments as Information Technology (IT), cyber security (CS) and Artificial Intelligence (AI). In addition to the above three departments, there is IT service Division (SD) which provides all infrastructure and network services to all other departments.

   The following table describe the resource allocation for each department.

Department	**Resources**
IT	40 computers and 2 printers
CS	20 computers and 1 printer
AI	30 computers and 1 printer
SD	10 computers and 1 printer

   Design a network to satisfy the following requirements in the university.

   - IT service Division (SD) is the place which distribute the all network related services. It has Domain Name Server (DNS) and proxy server.
   - Each department must be able to share the given printer using a Local Area Network (LAN).
   - A firewall must be implemented to provide the security for the network.
   - University has the network address of 197.20.10.0/24 IP address.

   a) If the above design is done with the sub-netting, find the number of bits for the subnet ID.

   b) Find the each department subnet address, broadcast address, range of address for each subnet and subnet mask.

   c) Draw the network diagram for the above requirements in the university.

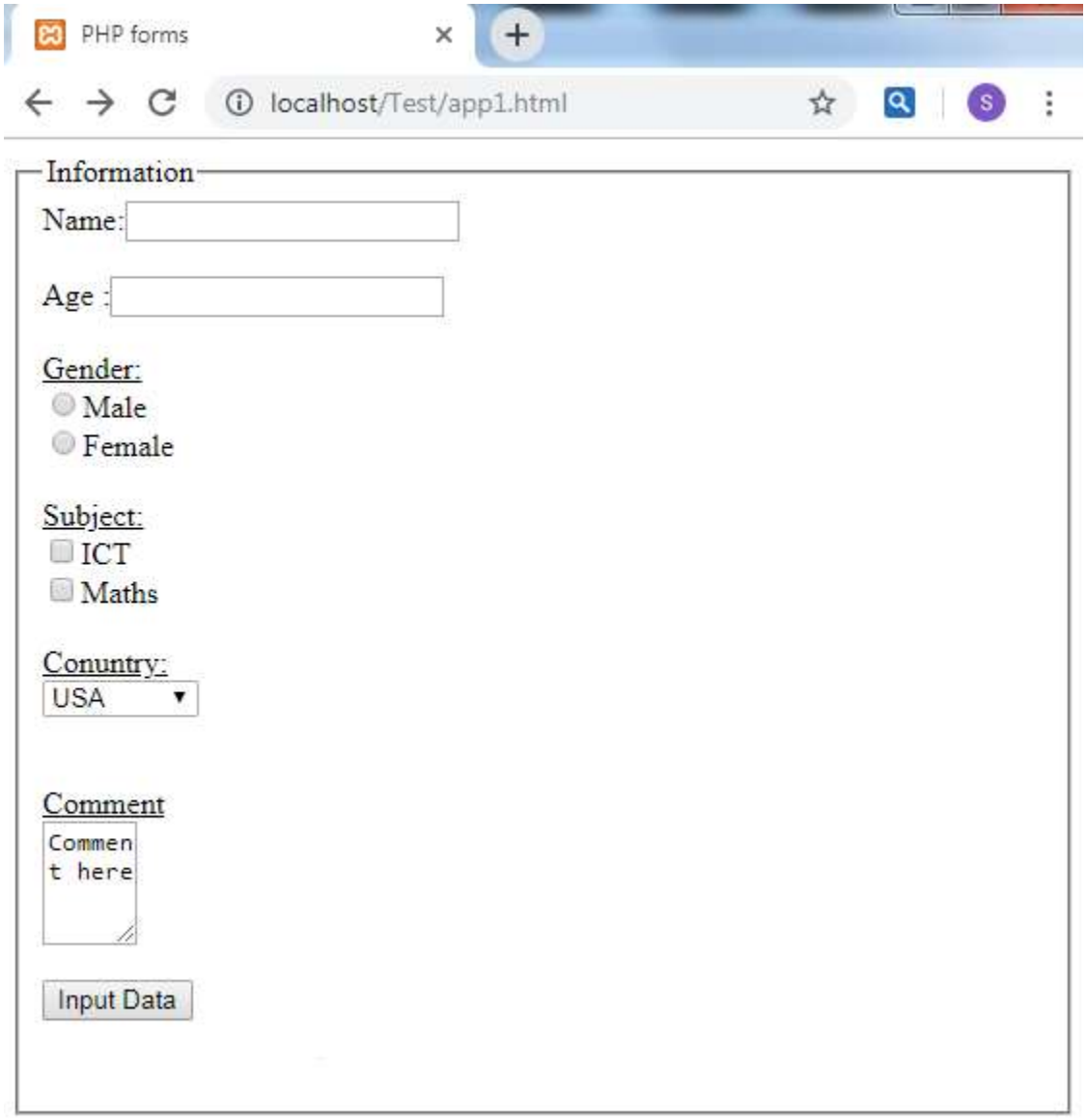
   d) Assume another department is planning to add to the university, find the number of bits for the subnet ID.

   e) Compare and contrast the TCP and UDP.

   f) How do you test the network connectivity between two machines in the above designed network?

3.

a) The ABC institute wants to get some information from each student. They have created the following form to collect those information. Write the HTML codes to get the following interface on the web browser.



b) When the student press the input data button the following page must be displayed. Write the PHP code to get the user entered data and display as follows:

4.

a) List the names of two mutable and immutable data structures.

b) What are the advantages of loop in programming language?

c) Compare and contrast the procedural and declarative languages.

d) The following program is the implementation of the bubble sort algorithm in Python language. Write the answers based on the following program:

```
def bubbleSort(arr):
    n = len(arr)
    for i in range(n):
        for j in range(0, n-i-1):
            if arr[j] > arr[j+1]:
                arr[j], arr[j+1] = arr[j+1], arr[j]
arr = [64, 34, 25, 12, 22, 11, 90]

bubbleSort(arr)
print ("Sorted array is:")
for i in range(len(arr)):
    print ("%d" %arr[i]),
```

i. Does this algorithm sort elements in **ascending** order or **descending** order?
ii. What is the task performed by the ***len()*** function?
iii. How do you modify the code to sort the numbers **reverse** order instead current order?
iv. Modify the code to find the **minimum** value and the **maximum** value?
v. If a user is reading 10 numbers from the **key board** instead of taking the numbers from the list, how would you update the code?
vi. If a user wants to write the outputs to a text file named as log.txt, how would you update the code using a function named as ***writedata ()?***

5.

a) Compare and contrast the waterfall and spiral system development life cycle models.

b) Why do we need to analyze the requirements in system development?

c) What is the difference between the functional requirements and non-functional requirements?

d) Compare and contrast the white box and black box testing.

e) Draw a context diagram to show the overview of the bank system describe below. Clearly indicate external entities, data stores and data flows of your diagram and state any acceptable assumptions that you have made.

The New Technology Bank (NTB) provides mobile transactions facilities to customers through an online system named as Mobile Transaction Management System (MTMS). The user should submit the application form to NTB to become a member of the MTMS. The NTB evaluate the application and enters it to MTMS, if it is approved. After entering the application data, MTMS issue an activation code to NTB which in turn passes it to the relevant person. Once the activation code is received the person becomes a member of MTMS. A member can obtain username and password by providing the activation code to the MTMS. A member can make transactions by entering username and password to the MTMS.

f) Identify the following requirements as functional or non-functional requirements.

i. Only Managerial level employees of the NTB have the right to view revenue data.
ii. The MTMS software system should be integrated with banking API.
iii. The MTMS system development cost should be less than 25 million rupees.
iv. A MTMS system should be capable enough to handle 1 million users without affecting its performance.
v. The MTMS system should be completed within 6 month.
vi. All web pages of the MTMS shall load within 4 seconds

6.

a) Why do we need to normalize the database before store the data?

b) ABC group owns a number of supermarkets which are spread across Sri Lanka. The group expects to develop a software system to automate functions of its supermarkets. Assume that you are hired as a database developer to develop a database to store the data required for the software system. Use the following description to draw an ER diagram to describe the data to be stored in the system.

The group identifies each supermarket by a unique supermarket ID. The group also requires to store the address and the phone number of the supermarket. Each supermarket has dedicated group of employees working in it. At the point of recruitment each employee is assigned with a unique employee ID. The group requires to know the name, NIC number, birth date and phone number of each employee. One of the employees working at the supermarket is assigned with the position of manager.

The supermarket sells a wide range of items. For each item in the supermarket, the system should store an item code, description of the item, type of the item (e.g. poultry, dairy, and beverage), unit price of an item and its re-order level. Customers place orders for items. For each order placed by a customer, the system should store the date of the order and assigns a unique id for the order. An order may contain

multiple items. It may also contain one or more of the same item. The supermarket wishes to provide special discounts for its loyal customers. For the above purpose the supermarket stores the ID, name of the customer, phone number, address and the total points the customer has earned for orders he had placed.

c) One use of the telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status. Telemedicine includes a growing variety of applications and services using two-way video, email, smart phones, wireless tools and other forms of telecommunications technology.

   i. Describe the main advantages of the telemedicine.
   ii. What is the main challenge in the implementation of the telemedicine in Sri Lanka?
   iii. What are the main devices needed to implement the system?
   iv. Suggest an AI based device that can be used in telemedicine.