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கல்விப் பொதுத் தராதரப் பத்திர(உயர் தர)ப் பரீட்சை, 2013 ஓகஸ்ற்
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புதிய பாடத்திட்டம்
New Syllabus

තොරතුරු හා සන්නිවේදන තාක්ෂණය II
தகவல், தொடர்பாடல் தொழினுட்பவியல் II
Information & Communication Technology II

20 E II

Part B

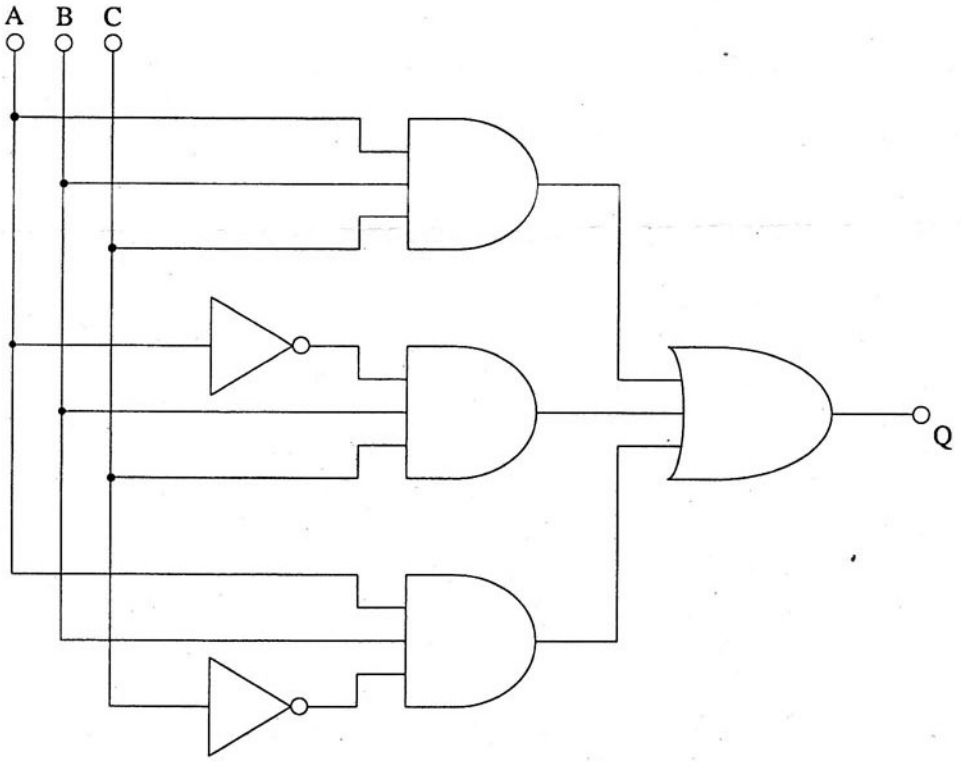
* *Answer any* ***four*** *questions only.*

1. (a) A fire alarm system consists of three sensors S1, S2 and S3 to detect smoke, flame and heat respectively. A sensor can either be active (sends the logical value 1) or inactive (sends the logical value 0). The system automatically triggers the fire alarm when at least two of the sensors are active.

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

(ii) Derive the Boolean expression to represent the above truth table.

(b) Consider the logic circuit shown here to answer the sections (i) and (ii) below:



(i) Write and simplify the Boolean expression for the above circuit using Boolean algebra. Show all the workings and algebric rules used for the simplification.

(ii) Construct the logic circuit using a combination of only AND, OR and NOT gates for the simplified Boolean expression obtained in section b(i) above.

2. (a) Compare and contrast the following communication technologies:
   (i) ISDN vs ADSL
   (ii) CDMA vs GSM

   (b) Give the main function of the following servers:
   (i) Web server
   (ii) Mail server
   (iii) Proxy server
   (iv) DHCP server

   (c) An organization has installed a web server, a mail server, a proxy server and a DHCP server to provide Internet based services to its employees. There are ten (10) computers in the organization connected to a local area network. IP addresses are dynamically allocated to these ten computers.

   Assume that adequate network cables and two network switches are provided to connect computers to the network. Each switch is capable of connecting a maximum of sixteen (16) computers to the network.
   (i) Draw a network diagram to show how these ten computers are connected to the local area network.
   (ii) Draw a **separate** network diagram to show how the web server and e-mail server are connected to the Internet.
   (iii) Draw **another** network diagram to show how the two networks designed in c (i) and c (ii) above can be connected using a proxy server in order to provide Internet connectivity to computers connected to the local network.

3. The director of a hospital has decided to maintain clinical history and demographic data, of all the patients visiting the hospital, in a database. After the first visit of a patient, his/her clinical history is available to the physician examining the patient.

   (a) Give **two (02)** main reasons for replacing a manual record keeping system with an electronic database system?

   (b) Discuss **two (02) disadvantages** of maintaining clinical history in a database.

   (c) Can maintaining clinical history of patients in a database be considered as a component of e-Government? Justify your answer.

   (d) The director of the hospital decides to allow external parties, such as, insurance companies to access this database to obtain information. As an ICT student, what is your opinion on the decision made by the director?

4. (a) Explain what is done by the Python interpreter when executing the following program.
   Your explanation should include the types assigned to variables and type conversions.

```
a = 4
b = 4.7
c = a + b
```

   (b) Explain what will happen when the statements of the following Python program are executed.

```
total = 0.0
x = float(input("Enter a number:"))
while x > 0 :
    total = total + x
    x = float(input("Enter a number:"))
print(total)
```

   (c) You are requested to write a Python program to find and display the maximum value of given 10 integers. The program should read integers one at a time.
   (i) Propose an algorithm to solve the problem using a flow chart.
   (ii) Write a Python program to implement your flow chart proposed in section c (i).

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5. Draw an Entity Relationship (ER) diagram to represent the scenario given below. The attributes and the primary keys of entities should be clearly indicated. State if any assumptions that you make clearly.

   ABC cab Service Company **does not** own any car. Private car owners can register with the company and also rent their cars. Some car owners provide more than one car to the company. The company hires drivers for these cars. Any car available for rent can be driven by different drivers on different days. Car owners are responsible for maintenance of their cars in order to provide a reliable service to the customers. After completing each hire, the driver informs his current location to the company. When a customer requests a car, the company looks for the availability of a car in the vicinity of the calling area. If a car is available, company assigns that to the customer and informs both customer and the driver. The company tries its best to assign the nearest available car to the customer to make its services more efficient. The company keeps customer information such as name, address and the contact telephone number to provide a better service to their regular customers. The customers can also inform to the company whether they are happy with the services provided by the driver. This information is used when assigning drivers to the customers. Each car owner, car, driver and the customer are given "ownerId", "carId", "driverId", and the "custId" respectively to identify them uniquely.

6. A delivery service company established in Sri Lanka receives over 1 million parcels per day for distribution. In order to send them to different parts of Sri Lanka, these parcels should be sorted and put into appropriate delivery vans. At present, 5 people at the sorting department do this process manually. This process has a drawback of putting parcels into wrong delivery van. Taking at least 3 days to distribute parcels received within a day is also a weakness in this process. Therefore, the general manager has decided to automate the sorting process by using a bar code system. The bar code pasted on parcel consists of the receiver's postal code. The proposed computer based system will read these bar codes, sort the parcels automatically and put them into the correct delivery van through a conveyor belt without human intervention. The general manager strongly believes that computerization will help them to overcome the current problems in the sorting process.

   (a) Identify **two** functional requirements of the proposed computer based system. Justify your answer.

   (b) State **two** non functional requirements of the system with justifications.

   (c) Discuss, giving **two** reasons, whether the general manager's decision to computerize the sorting process is correct or not.

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