නව නිර්දේශය /புதிய பாடத்திட்டம் /New Syllabus

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
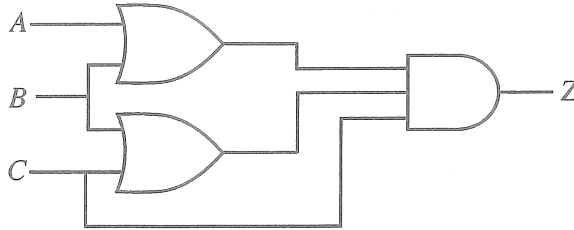General Certificate of Education (Adv. Level) Examination, 2020

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Part B

* Answer any *four* questions only.

5. Consider the logic circuit shown in the figure, in which *A*, *B* and *C* are the inputs and *Z* is the output.

(a) Give the complete truth table for the given circuit.

(b) Using a Karnaugh map, derive a simplified sum-of-products (SOP) expression for the output *Z*.

(c) Using a Karnaugh map, derive a simplified product-of-sums (POS) expression for the output *Z*.

(d) Of the two expressions (SOP and POS) you obtained in (b) and (c) above, which one is better to implement a more simplified logic circuit than the given logic circuit above? Explain your answer.

6. Consider the following scenario:

The PQR Company has three departments, namely *Finance*, *Marketing* and *Human Resource* (HR). At present all the activities of the PQR Company are conducted manually. The company decides to computerize all their activities by establishing an IT unit with a computer lab for staff training. Resources will be allocated for each department and the IT unit as follows.

Department	Resources		
	Computers	Printer type	Software Server
Finance	28	01 Network Printer	Accounting Information System (AIS)
HR	40	01 Network Printer	Human Resource Information System (HRIS)
IT Unit	50	01 Printer	Learning Management System (LMS)
Marketing	35	01 Network Printer	Marketing Information System (MKIS)

The company proposes the following:

● A Local Area Network (LAN) for each Department and the IT unit in order to share specific software and resources

● LANs in each department to be interconnected via IT unit

● All computers to be given efficient Internet connectivity with the help of a DNS (Domain Name System) and proxy servers

● An Internet Service Provider (ISP) to supply the Internet connectivity to the IT unit

● The entire network to be protected through a firewall

(a) Which network topology is the most suitable to satisfy all the above mentioned requirements? Give **one** reason to justify your answer.

(b) The Network Administrator has received 192.168.14.0/24 as the IP address block for the company. The IP addresses for the nodes are to be allocated after making four subnets from this address block for each department/unit.

The following incomplete table shows the sub-netting. Write down the missing IP addresses for each department/unit using the following table format. (Assume that subnetting is done under the consideration of future expansion of each department/unit.)

Department	Network ID	Broadcast ID	Subnet Mask	Usable IP Address Range
Finance	192.168.14.0	192.168.14.63	255.255.255.192	192.168.14.1–192.168.14.62
HR				
IT Unit				
Marketing				

(c) Showing clearly the connection topology and the devices, draw the logical arrangement for the company network that the network administrator can implement to fulfill the company's requirements. (Assume that additional IP addresses can be obtained.)

(d) Network administrator decides to dynamically manage the IP addresses of the entire network. Write down the mechanism that needs to be implemented to achieve this task.

7. (a) AB Stores is a grocery shop in your home town. With your expert advise, AB Stores has implemented a web-based e-commerce system to conduct their business online as well. Customers can select their required products and confirm the order online.

(i) What is the e-commerce business type applicable in this scenario?

(ii) What is the revenue model used in this e-commerce offering of AB Stores?

(iii) The e-commerce solution of AB Stores became popular rapidly with a growing userbase. However, it was noticed that most of the regular customers from the local community still preferred using the physical outlet than the e-commerce offering. Identify **two** possible reasons for such preference.

(iv) AB Stores extended its e-commerce system to integrate with its suppliers' systems to maintain its product stocks through automation. What is the e-commerce business type AB Stores implements with this system modification?

(v) AB Stores decides to expand its e-commerce solution allowing other local shops to have virtual stores within the system. What is the term used to identify the proposed system?

(vi) Write down **one** advantage that **each** of the following will receive by having the proposed system in (v) above.
(1) Customers
(2) AB Stores
(3) other local shops

(vii) A recent market survey has identified the following about the customers who have registered with the AB Stores e-commerce system proposed in (v) above:

- 98% are nearby residents within a 2 km radius.

- 12% of them are able to pay online (either through credit/debit cards or mobile cash options)

- 18% do not wish to pay in advance for a future transaction.

What is your suggestion to enable most of the registered customers to make purchases successfully through the system and receive their goods at home without any restriction? Explain your answer.

(viii) With the expected growth of the e-commerce business of AB Stores, you have advised them to outsource the delivery of customer purchased goods to a third-party delivery service. Explain **two** advantages AB Stores can get by doing so.

(b) Multi agent systems can be used to replace some of the work that require humans. The following scenario explains about **myTours** multi-agent system used to build customized travel packages including flight booking, hotel room reservation and taxi booking for local travel during the tour.

A prospective traveler (user) can access **myTours** website over the Internet and a chat-bot agent starts interacting with the user. User can use voice or text as the input medium. During this interaction chat-bot passes the extracted information to a search-agent who will take over from the chat-bot agent and proceed to search for travel packages for the user. The search-agent has a group of agents each specializing for particular type of travel service such as flight search, hotel search etc. Once the search results are obtained the search-agent prepares the list of travel packages with details and displays to the user for confirmation.

(i) Draw a simplified agent diagram of the above explained multi-agent system. Name the important entities in your diagram.

(ii) Which agent **cannot** be considered as self-autonomous?

(iii) Write a **disadvantage** of using a multi-agent system for the given example user requirement.

8. (a) You are given two positive integers N1 and N2 as inputs (assume N1 < N2) and you have to output the list of even numbers between N1 and N2. Construct a flowchart or a pseudo code to express an algorithm for this purpose.

(b) Consider the flowchart given below. Assume that L is a list of positive integers, K is a positive integer and every element in L is less than M, which is a large integer.
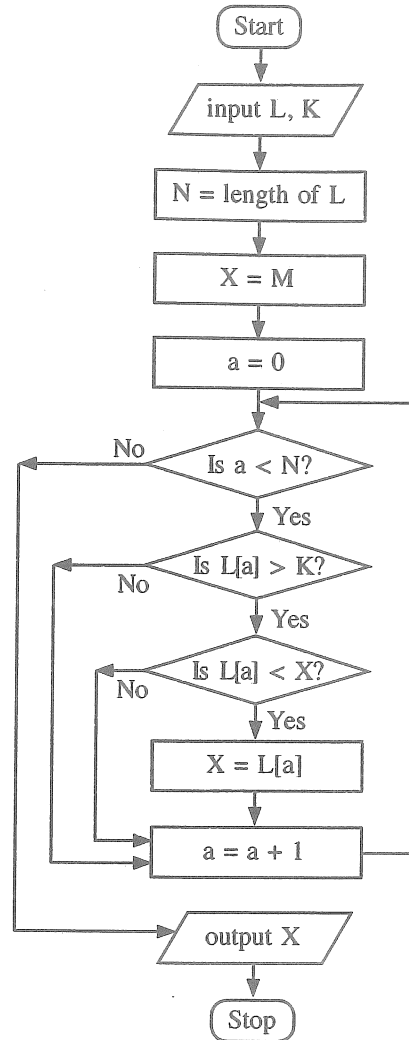
(i) What would be the output if the first input L was 2, 4, 7, 9, 3, 5 and the next input K was 5?

(ii) What is the purpose of this algorithm?

(iii) Develop a Python program to implement the algorithm expressed by the flowchart.

9. (a) Consider the following description relating to details of players attached to different sports clubs. A player always belongs to a sports club and he/she can be identified uniquely by the NIC (National Identity Card) number. Further a player has a name which consists of a surname and initials.

A club which is uniquely identified by its name can have many players. A player can play games. Each game in this context is given a unique code and a description. A player can play more than one game and each game is played by at least one player.

Note : Use only the relevant words in the above description when drawing the Entity-Relationship (E-R) diagrams for the following questions.

  (i) Draw an ER diagram for the above description.

 (ii) Extend the ER diagram in above (i) to include the number of hours played by each player for each game.

(iii) Player may have a sponsor who has a unique title. A sponsor can give sponsorship only for one player. Extend further the ER diagram in part (ii) above to include the sponsor's details.

(b) The 'Winner' table given below contains the details of the players who won different matches and medals. There is a fixed amount of prize money given to each medal type. A Gold medal has Rs. 20,000/=, a Silver medal has Rs. 10,000/= and a Bronze medal has Rs. 5,000/=.

Consider the primary key of the Winner table as NIC and MatchID.

Winner Table

NIC	MatchID	MedalType	Prize
951477751V	BD-2	Silver	10000
985467923V	BD-2	Gold	20000
995874159V	BD-1	Gold	20000
997656614V	BD-3	Silver	10000
951477751V	BD-1	Bronze	5000

  (i) Write an SQL statement to display the number of players who won "Gold" medals.

 (ii) In which normal form does the above table exist? Justify your answer.

(iii) Convert the above table to the next normal form. (It is **not required** to write the data in the tables derived in next normal form.)

10. (a) The 3-stage procedure for handing over a letter for registered post to a post office is as follows:

 ● Determining Postage

   The customer hands over the letter to the **Registration Counter**. The letter is weighed and the postage for the relevant weight is read from a table. The postage is written on the letter by the counter and it is given to the customer.

 ● Issuing Stamps

   The customer hands over the letter with the postage written on it to the **Stamps Counter** with the amount of postage. Stamps for the postage and the letter are issued to the customer with any balance due by the **Stamps Counter**.

 ● Registering Letter

   The customer sticks the stamps on the letter and hands it over to the **Registration Counter**. The **Registration Counter** accepts the letter, sticks the 'Registered Post' label with a unique identification code to the letter, keeps the letter and issues a receipt with sender and recipient information with the date and the amount paid, to the customer.

Using standard symbols, draw the following:

(i) Context Diagram

(ii) Level 1 Data Flow Diagram (DFD)

(b) Your school plans to use an online system to provide extended learner support to A/L and O/L students during school holidays, weekends and other times that the school is not open. It is decided to use a suitable Commercial-Off-The-Shelf (COTS) software system for this need. Your team has been requested to help with this project.

(i) Some of your project team members argue that since COTS software are to be used there is no need of requirement analysis. List **three** most significant reasons to explain why you must complete requirement analysis even in this project. **Note:** Your answer must be specific to a project with COTS software use. Generic answers will not be accepted.

(ii) Following are part of the requirements identified for the above project. Identify and write down the labels (A–G) of all the *functional requirement* statements within the list.

(A) Teaching material and learning content upload to the system shall only be allowed to the teachers assigned to that particular learning session.

(B) The system shall be available for user access at least 99.9% of the time.

(C) The access history for each student's learning activity participation or content use within a course must be maintained as a report to be accessed by the subject teacher.

(D) The system should be easy to work with after 1 hour of training.

(E) At the end of each learning session, the students must be provided with an option to ask questions from the teacher.

(F) The system should respond to any user request within 2000ms.

(G) The system should be able to serve a minimum of 200 concurrent users at a given time.

(iii) What is the most appropriate testing strategy for your team to evaluate the selected COTS software system for the identified requirements?

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