

Second Term Evaluation - 2025

Grade

13

Information and Communication Technology

PART B

Essay – Part B

** Answer any four questions only*

1. A simple burglar alarm system works based on the following three conditions: A = Door sensor (1 if door is open, 0 if closed). B = Window sensor (1 if window is open, 0 if closed). C = Motion sensor (1 if motion is detected, 0 if no motion). The alarm (Output = 1) will be triggered if either: The door is open and motion is detected, OR The window is open, regardless of motion.

- Construct the truth table for the above requirement (4 marks)
- Write the POS expression for the output. (2 marks)
- Simplify the POS expression using Boolean rules. Clearly mention the rules. (3marks)
- Prove your simplified answer using K-MAP to simplify the POS. (3marks)
- Draw the logic circuit using only NOR gates for the simplified output. (3marks)

2. Anuradha said that a company owns a network which has 192.168.57.0/23 IP address block. Assume that Anuradha wants to create four subnets namely, Subnet P, Subnet Q, Subnet R and Subnet S from the address block with following resources.

Subnet	Hosts
P	50
Q	100
R	150
S	20

- Thilini says that one is not a correct network IP. Do you agree with that statement? Prove your answer with calculations. (2 Marks)
- Write the subnet mask, Network IP and broadcast IP of the correct IP address above in dotted decimal notation. (3 marks)
- Once sub netting is done with corrected IP block, fill in the following table. (4 marks)

Subnet	Subnet mask	Net IP	Broadcast IP	Usable IP range
P				
Q				
R				
S				

- (iv) Write two advantages of using mesh network topology over the ring topology. (2 mark)
- (v) Write down the main function of the protocol given below. (1x2 marks)
 - a) HTTP
 - b) DNS
- (vi) Write the main function of the servers given below. (1x2 marks)
 - a) NAT server
 - b) Mail server

3.

- (i) A computer uses 32-bit virtual addresses. This computer has a 1GB physical memory and a 8 KB page size.
 - a) Write down the number of pages created in virtual memory as a power of 2. (1 mark)
 - b) Write down the number of frames in physical memory as a power of 2. (1 mark)
 - c) Assume that processor need to access the virtual reference 16400 at a particular time. What is the page number that address exist? If that page is mapped to frame number 10, write corresponding physical address in binary. (3 marks)
 - d) Assume that in addition to memory frame information, each page table entry for a virtual page in this computer contains some additional information consisting of a total of four bits.
 - (A). Calculate the page table entry size. (1 mark)
 - (B). Calculate the size of the page table created in bits. (1 mark)
- (ii) Mr. Rakitha starts a python application to create a program on his single processor computer. After few minutes he start notepad application to get the copy of designed code to the program.
 - a) What is the process state that python process transitioned when starting notepad. (1 mark)
 - b) Give one reason for transition you mentioned above. (1 mark)
 - c) Write the important information stored in the program counter of python process PCB (1 mark)
 - d) After completing the python, it will save in the removable flash drive.
 - (A). What is the process state that python process transitioned on that occasion? (1 mark)
 - (B). Give one possible reason for that transition. (1 mark)
- (iii) cal.py is the python file with 66 KB capacity which stored in the flash drive which has 4KB sized blocks.
 - a) How many blocks needed to store the file? (1 mark)
 - b) Is there internal fragmentation will happen in this scenario? Explain your answer. (2 mark).

4. Consider the registration table given below.

StudentID	StudentName	CourseID	CourseName	StartDate	EndDate	Phone_01	Phone_02
101	Heshan	CSE101	DBMS	2024.01.01	2024.06.01	0332222201	077987654
101	Heshan	CSE102	OS	2025.01.01	2025.06.01	0332222201	077987654
102	Rajapaksha	CSE101	DBMS	2024.06.01	2024.12.01	0332222205	071765432
103	Anjana	CSE103	PYTHON	2025.01.01	2025.06.01	0332222265	072543210

- (i) Mention the normalize form that above table exist. Justify your answer.(2 marks)
- (ii) Write two dependencies exist in the table given above.(1 marks)
- (iii) Convert the **registration** table into 3rd normal form relations.(No need to write the data). (4 marks)
- (iv) Construct an Entity-Relationship (ER) diagram based on the relations derived in (iii). (4 marks)
- (v) Write the SQL statements to do the followings.
 - a) add the Record of Heshan to student table derived question iii . (2 marks)
 - b) Add primary key (CourseID) to the course table. (2 marks)

5. Consider the Kumesha Book shop sales requirements given below.

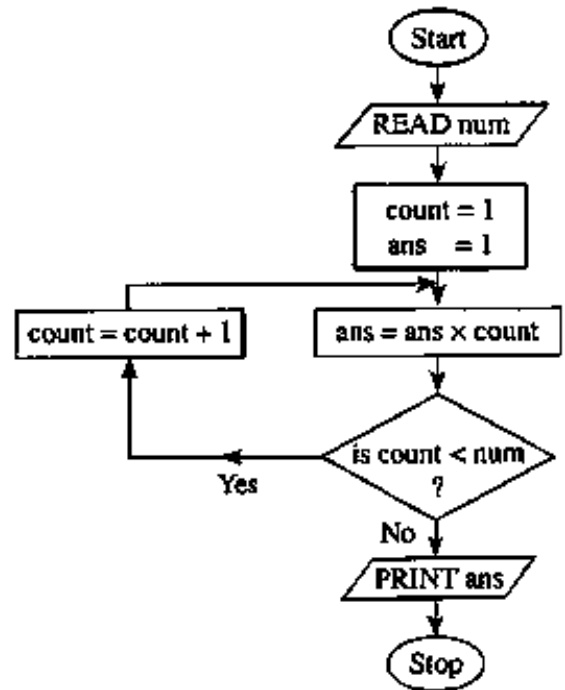
- (i) Write a Python program to input item and price of 6 stationary items given below in to list named **stationary_items** as user inputs.(ex:[('Pen', 35)] (4 marks)
 - Pen : 35
 - Pencil : 25
 - Ruler : 30
 - Glue : 80
 - A4_sheet : 4
 - Eraser :20
- (ii). Write a python program to calculate the total bill of a person when input the stationary item and the quantity from each item by the cashier. Person can select more than one items and quantity from above **stationary_items**. (5 marks)
 - Hint: After entering the stationary items cashier will enter “0” for exit the loop and display the bill.

(iii) Consider the flow chart given below.

(a).Write the output when input num is 6 for the program. (2 marks)

(b).Explain the purpose of the program. (1 marks)

(c).Write a python function to implement the flow chart. (3 marks)



6. A Medical laboratory has the following activities when patient came to do a test.

The patient hands over the test request slip to the Cashier of the laboratory. Then she go through the medical tests book and find the price of the test and preparations for the test. If patient is prepared for the test then he/she give the patient details to the cashier. Then cashier store patient details in patient registration book and issues an invoice to the patient. Then Patient give the money to the cashier. Then cashier give the receipt with any balance to the patient. Then patient hand over the copy of receipt to the phlebotomist and The phlebotomist verifies the patient and collects the blood sample and returns the updated receipt marked as 'done' to the patient. When the MLT done the test, the reports will be compiled using test results slip and slip will put in the Results slip tray. In an emergency or critical condition with the health of the patient, test results will inform to the referred doctor by the MLT. Then MLT sends the report to the cashier. Later, the patient hands over the updated receipt to the cashier and the cashier hand over the report to the patient with the re-updated receipt marked as 'issued'.

- (i) Name two locations other than cashier, can be identified in the system given above.(2 marks)
- (ii) Draw the Level 1data flow diagram for the above activities using the processes of three locations given above. . (10 marks)
- (iii) Name and represent three sub processes of cashier according to the level 2 data flow diagram. (3 marks)