Continuous Assessment Test I – January 2025

Programme	: B.Tech. (ECE) & B.Tech. (ECM)	Semester	: Winter Sem 2024-25
Course Code & Course Title	: Cryptography and Network Security	Class Number	: CH2024250501514 CH2024250501512
Faculty	Dr. T. Jayavignesh Dr. Vydeki D	Slot	: A1 + TA1
Duration	: 90 Minutes	Max. Marks	: 50

Answer all questions

Q.No. Sub. Sec.	Questions	Marks	Bloom Taxonomy Level
1.	Imagine you are a security consultant for a company, and your task is to educate employees about potential threats to their digital assets. Can you provide a taxonomy of security attacks and briefly explain each type with a relevant example?	[10]	1
2.	(i) Encrypt the message "the key is hidden under the door pad" using Playfair cipher with the symmetric key "GUIDANCE". Decrypt the message to get the plaintext.	[6]	3
	(ii) Use the Vigènere cipher with key "HEALTH" to encrypt the message "life is full of surprises".	[2]	
	(iii) What sub-type of traditional cipher(s) does part (i) and part (ii) belong to? How resistant are these two ciphers to attacks?	[2]	

Note: Ignore space between words in the message.

3.	Consider the following dramatic piece taken from 7th century's Brahma-Sphuta-Siddhanta, with minor changes. *An old woman goes to market and a horse steps on her basket and crashes the eggs. The rider offers to pay for the damages and asks her how many eggs she had brought. She does not remember the exact number, but when she had taken them out three at a time, there were two eggs left. When she picked them out five at a time, four eggs were left. When she took them seven at a time she had five eggs left.*	[10]	4

(i) What is the smallest number of eggs she could have had?

(ii) If the horse rider agrees to pay one silver coin for every 10 eggs, how many coins he would pay approximately?

4. (i) Find the count of integers in Z_{180} that are smaller and relatively prime to 180. Also find the multiplicative inverse of 7 using the extended Euclidean algorithm in Z_{180}. [6]

3

(ii) Find whether the set of residue classes (mod 3) form a group with respect to modular addition. Explain with examples. [4]

5. Imagine a bank wants to securely encrypt sensitive transaction data before sending it to a remote branch. Can you explain the process of encryption using DES (Data Encryption Standard) with the help of a clear diagram? [10]

1

225

VIT
Vellore Institute of Technology
CHENNAI

Continuous Assessment Test (CAT) – I – JANUARY 2025

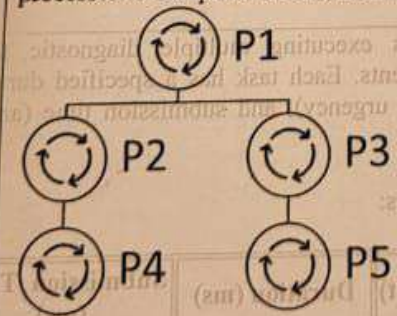| Programme	:	B.Tech (CSE and its Specialization)	Semester	:	Winter Semester 2024-25
Course Code & Course Title	:	BCSE303L Operating Systems	Class Number	:	CH2024250502585 CH2024250502589 CH2024250502592
Faculty	:	Dr.M.Revathi Dr. Afruza Begum Dr. P.Anandan	Slot	:	B1+TB1
Duration	:	90 Minutes	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.

Answer all questions

Q. No	Sub Sec.	Description	Marks
1		Assume that you have been appointed as an Operating System Design Engineer for a mobile phone company. Propose a suitable architecture with neat sketch for the above. Also provide a detailed explanation of structure with the key functionalities. **(7 marks)** Compare the proposed architecture with the other architecture, highlighting at least three advantages and disadvantages. **(3 marks)**	10
2	a	A hospital's central server is executing multiple diagnostic tasks submitted by different departments. Each task has a specified duration (burst time), priority (based on urgency), and submission time (arrival time). The diagnostic tasks ae as follows:	20

Task	Priority (Lower = Urgent)	Duration (ms)	Submission Time (ms)
T1	3	10	0
T2	2	5	1
T3	1	8	2
T4	4	6	3
T5	5	12	5

The IT team from the hospital is given with the task of identifying an effective technique for executing the above tasks under the following

conditions.

i. Execute the tasks in the order of their arrival times and calculate the waiting time and Turnaround time for each task. **(6 marks)**

ii. Execute the tasks in the order of burst time. Interrupt the ongoing task and replace with a task with less burst time when it is arrived. Identify a suitable algorithm and calculate the waiting time and turnaround time for each task. **(4 marks)**

iii. Execute the tasks based on urgency levels. Current ongoing task may be pre-empted with higher priority tasks. Calculate the waiting time and turnaround time, response time for each task and throughput of the scheduling algorithm. **(8 marks)**

iv. Compare each algorithm based on average waiting time and turnaround time and suggest the best algorithm for the given scenario. **(2 marks)**

3	a)	Devise a program to create the processes as per the process hierarchy mentioned in the diagram to perform various arithmetic operations P1: Collects two input numbers from the user. P2: Performs addition of the two numbers collected in P1. P3: Performs subtraction of the two numbers collected in P1. P4: Calculate the square of output obtained in P2. P5: Print the process id of the processes P1,P2,P3,P4 and P5 The program should ensure that each parent process waits for its child processes to complete before terminating. **(12 Marks)**	15
	b)	Assume that in the given program the process P1 terminates unexpectedly. What happens to the processes P2, P3, P4 and P5? Suggest the solution to handle it effectively. **(3 marks).**	
4		A company is developing a web server that needs to handle multiple client requests to read data from a database. What are the benefits of using multithreading for this web server compared to multi-process approach? **(5 Marks)**	5

Programme	:	B.Tech. CSE and Specialization, B.Tech. Electronics and Computer Engineering	Semester	:	Winter 24-25
Course Code & Course Title	:	BCSE307L & Compiler Design	Class Number	:	CH2024250502555 CH2024250502557 CH2024250502559
Faculty	:	Dr. S. Kiruthika, Dr. Suganya R. Dr. Manju G	Slot	:	C1+TC1
Duration	:	90 MINUTES	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks
1		Consider the following fragment of C code: **float i, j;** **i = i * 70 + j + 2;** Write the output for machine dependent and independent phases of compiler.	10
2		Convert the regular expression $(a|b)^*a\,(a|b)$ to DFA using direct method.	10
3	a.	Construct LL (1) parsing table for the below grammar. (10 Marks) $S \rightarrow A$ $A \rightarrow aB \mid Ad$ $B \rightarrow bBC \mid f$ $C \rightarrow g$	15
	b.	Using the constructed parsing table, check the acceptance of the string **abbfg**. (5 Marks)	
4		Consider the below grammar and parse the string $1+ (2*3)-7$ using shift reduce parser. $expr \rightarrow expr\ op\ expr$ $expr \rightarrow (expr)$ $expr \rightarrow num$ $op \rightarrow +\mid-\mid^*\mid/\mid^{\wedge}$ $num \rightarrow 0|1|2|3|4|5|6|7|8|9$	5

5		Consider the following grammar A → (B) | id B → B * A | A Parse the input string (id * (id * id)) using Operator Precedence parser.	10

**********All the best *************

Reg. No.: 22BLC1314

Name : P. Anirudh varma.

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1996)

Continuous Assessment Test I – January- 2025

Programme	: B.Tech (ECE/ECM/CSE-AI)	Semester	: WS 2024-25
Course	:	Code	: BCSE332L
	Deep Learning	Class Nbr	: CH2024250501490
			CH2024250501491
Faculty	: Dr. SUCHETHA M	Slot	: E1
	Dr. ROHITH G		
Time	: 90 Minutes	Max. Marks	: 50

Answer ALL the questions

Q.No.	Sub. Sec.	Questions	Marks	BT Level
1.		Implement the following function with binary inputs and bipolar targets using a Hebb net for one epoch. Assume Initial bias is 1.	10	BT-3

x_1	x_2	y(target)
0	0	1
0	1	0
1	0	0
1	1	1

Q.No.	Sub. Sec.	Questions	Marks	BT Level
2.		Implement a Tic-Tac-Toe classifier using a perceptron rule for character recognition of symbols (×) and (O) which involves training the network to classify the two-dimensional input pattern and to adjust the weights based on the two patterns **(A)** and **(B)** as shown below.	10	BT-4

	×	O	×
	O	O	O
	O	×	O

(A)

	O	O	O
	×	O	×
	O	O	×

(B)

Q.No.	Sub. Sec.	Questions	Marks	BT Level
3.		A retail company in Mumbai is planning to open a series of stores across the city. The company has data on various neighbourhoods, likely indicating where demand for their products is highest. It is their responsibility to	10	BT-5

determine how many stores to open and to strategically place them so that they serve all areas with significant customer demand. The locations of these neighbourhoods are represented by the following coordinates: (1, 2), (3, 4), (6, 7), (8, 9), and (10, 11). These points should be grouped into clusters, with each cluster's center represented by its nearest mean (centroid), acting as the prototype for that cluster. The initial store locations are set at (1, 2) and (3, 4). Perform **K-Means clustering** until the new centroid is equal to the initial centroid.

4.

Given an input image of size 6×6, (with 1 channel), a **convolutional layer** with a 3×3 **kernel, stride = 1**, and **padding = 0**.

$$I = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 7 & 8 & 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 & 17 & 18 \\ 19 & 20 & 21 & 22 & 23 & 24 \\ 25 & 26 & 27 & 28 & 29 & 30 \\ 31 & 32 & 33 & 34 & 35 & 36 \end{pmatrix}$$

$$\text{Kernel} = \begin{pmatrix} 1 & 0 & -1 \\ 1 & 0 & -1 \\ 1 & 0 & -1 \end{pmatrix}$$

Calculate the output feature map after applying the convolution operation.

10   BT-4

5.

How does the concept of residual connections in ResNet help mitigate the vanishing gradient problem, and how does this architecture improve performance in deep neural networks?

10   BT-2

Course Faculty

⇔ ⇔ ⇔

22 MI A 1103

VIT

Programme	:	M.Tech (Integ)			
Course	:	Deep Learning	Semester	:	Winter 24-25
			Code	:	CSE4037
Faculty	:	Dr. Thomas Abraham J. V.	Class no.		CH2024250502195
		Dr. Pradeep Kumar T. S.			CH2024250502198
Time	:	1½ Hours	Slot(s)	:	B1
			Max. Marks	:	50

Answer ALL the Questions

S.No	Question Description	Marks
1.	Consider a scenario where you build a neural network for a speech recognition application. How would increasing the depth versus increasing the width of the network impact the model's performance? Support your answer with reasoning.	10
2.	Consider a multilayer feed-forward neural network with the initial values of weights and biases as given below. Let the learning rate be 0.01. Train the network for the training tuple $(0.5, 0.1, 1)$ where last number is target output. Show weight and bias updates by using back-propagation algorithm. Assume that sigmoid activation function is used in the network.	10
3.	You are asked to build a model for a medical imaging classification problem but have limited training data. Explain how transfer learning using a pre-trained CNN like ResNet can help.	10

4.	a)	Explain the role of activation functions in deep learning. Plot the activation functions ReLU, Sigmoid, Tanh, and Softmax. Provide scenarios where each activation function might be preferred.	5
	b)	A neural network outputs the following logits for three classes: $z = [3.2, 1.8, -0.5]$ a) Compute the probabilities for each class using the softmax activation function: b) If the predicted class (based on maximum probability) is incorrect for a given true label of Class 2, calculate the cross-entropy loss. c) Interpret the significance of the computed loss.	5
5.		Let us consider a Convolutional Neural Network having two different Convolutional Layers in the Architecture L1: Filter Size: 5 X 5, Number of Filters: 6, Stride-1, Padding-0, Average Pooling: (Filter Size: 2 X 2 with Stride-2) L2: Filter Size: 5 X 5, Number of Filters: 16, Stride-1, Padding-0, Max-Pooling: (Filter Size: 2 X 2 with Stride-2) If we give an RGB image as the input to the network of dimension 32 X 32, then compute the dimension of the vector after passing through a flattening layer. Draw the sample architecture of the CNN model.	10
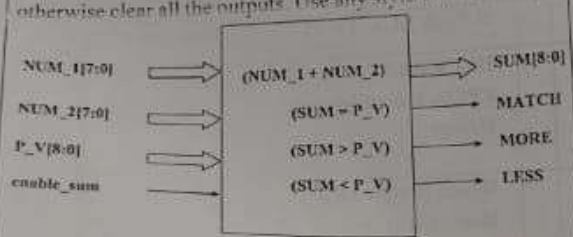
←-→

VIT

Vellore Institute of Technology

Continuous Assessment Test (CAT) – I – January 2025

Programme	:	B.Tech ECE, ECM	Semester	:	WS 2024-25
Course Code & Course Title	:	BECE406E FPGA-Based System Design	Class Number	:	CH2024250501354 CH2024250501368 CH2024250501371
Faculty	:	Reena Monica P Hemavathy S Jean Jenifer Nesam J	Slot	:	F1
Duration	:	90 Minutes	Max. Mark	:	50

General Instructions: Write only your registration number on the question paper in the box provided and do not write other information.

Answer all questions

Q No.	Sub Sec.	Description	Marks	Blooms Taxonomy Level
1.	a.	Elaborate on the unique features of the programmable logic blocks, programmable interconnections, and programmable I/O blocks of Altera FPGA with appropriate block diagrams. Use all terminology specific to Altera FPGA.	[7+3]	L2
	b.	List out the differences in interconnect architecture between Altera and Xilinx FPGA.		
2.	a.	Implement the function $F = A'C + A'B'D + ACD + A'BD$ in an FPGA that uses a 3-variable Look Up Table (LUT) and a 2-to-1 MUX. (i). Give the Truth Table for the LUT (3 Marks) (ii). Implementation using LUT with diagram (4 Marks) (ii). Provide the resource summary (1 Mark)	[8+7]	L3
	b.	Realize the following functions using PAL (7 Marks) $X = AB'D + A'C' + BC + C'D$ $Y = A'C' + AC + C'D'$ $Z = CD + A'C' + AB'D$		

			[10]	L3 & L4
3.	Write a Verilog code for the block shown in Figure 1 to compute the sum (SUM[8:0]) of two numbers, NUM_1 and NUM_2, and compare with a preset value, P_V[8:0]. If SUM equals the preset value, the output MATCH is generated; else if SUM is greater than the preset value, MORE is generated. Otherwise, the signal LESS is issued. Outputs must be valid only if 'enable_sum' is active, otherwise clear all the outputs. Use any style of modelling		

NUM_1[7:0] ⟹   (NUM_1 + NUM_2) ⟹ SUM[8:0]

NUM_2[7:0] ⟹   (SUM = P_V) → MATCH

P_V[8:0] ⟹   (SUM > P_V) → MORE

enable_sum →   (SUM < P_V) → LESS

Figure 1

			[15]	L4
4.	Design a high-performance 16-bit adder to add inputs A and B, each 16-bit wide. Divide the input bits into smaller, equal-sized groups, calculate the possible sum and carry results for each group concurrently, and determine the final result by selecting the appropriate output based on the carry propagated from the preceding group. Provide a clear diagram for the design and write a Verilog implementation for the circuit, including a testbench for verification.		

L1 – Remembering; L2 – Understanding; L3 – Applying; L4 - Analyzing

Programme	:	B.Tech (ECE/ECM/EEE)	Semester	:	WS 2024-25
Course Code & Course Title	:	BECE320E & Embedded C Programming	Class Number	:	CH2024250501225 CH2024250501230 CH2024250501222 CH2024250501229 CH2024250503024 CH2024250501235
Faculty	:	Dr. John Sahaya Rani Alex Dr. Revathi S Dr. R Balakrishnan Prof. Deepa M Prof. Sunkara Pavani Prof. Srinivasan R	Slot	:	G1
Duration	:	90 Minutes	Max. Mark		50

General Instructions: <Use this space to provide additional information such as graph sheet, data book etc.>
- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	Blooms Taxonomy Level

1	a	Can you explain the potential issues with assigning a large integer value to a variable declared as a "short int" with the following code snippet? What will be the output?
		short int x = 33767;
		printf("%d\n", x);
			3	L2

	b	How do you represent a Boolean value in C? Which header file is used for it?	2	L2

	c	What will be the output of the following code?
		#include <stdio.h>
		int main() {
		    int x = 10, y = 5, z = 0;
		    int a = 5, b = 10, c = 15;
		    z = x + y * 2;
		    printf("z = %d\n", z);
		    int result1 = x + y > 10 ? x : y;
		    printf("result1 = %d\n", result1);
		    int result2 = a < b && b < c;
		    printf("result2 = %d\n", result2);
			5	L2

		Note: The program should be written only by using IF-ELSE, SWITCH CASE, DO-WHILE and GOTO statements.		

3	a	s1, s2, and s3 are three string variables. Write a C program to read two string constants into s1 and s2 and compare whether they are equal or not. If they are not, join them together. Then copy the contents of s1 to the variable s3. At the end, the program should print the contents of all the three variables and their lengths. (5 marks)
		
		C program contains the following statements.
		
		`int i, j = 25;`
		`int *pi , *pj = &j;`
		`*pj = j + 5;`
		`i= *pj + 5;`
		`pi = pj ;`
		`*pi = i+ j;`
		
		Suppose each integer quantity occupies 2 bytes of memory. If the value assigned to i begins at hexadecimal address F9C and the value assigned to j begins at address F9E, then
		
		(a) What value is assigned to pj?
		(b) What value is assigned to *pj?
		(c) What value is assigned to i?
		(d) What value is represented by (pi + 2)?
		(e) What value is represented by the expression (*pi + 2)?
			10	L3

4	a	An International Standard Book Number (ISBN) is a 10-character identifier for books published by international publishers, formatted as follows: (0-07-041183-2). The ISBN consists of four parts: the region (first part), the publisher (second part), the book (third part), and a check digit (fourth part). The check digit is calculated using the following formula: Sum = (1 × first digit) + (2 × second digit) + (3 ×third digit) + - - - - + (9 × ninth digit). The check digit is the remainder when the sum is divided by 11. Your task is to write a C program that reads an ISBN number, verifies its format, and checks whether the ISBN is valid by calculating the check digit.	4	L3
	b	Write a program that fills a five-by-five matrix as follows: - Upper left triangle with +1s - Lower right triangle with −1s - Right to left diagonal with zeros Display the contents of the matrix	4	L3

	c	How many times "Hello" is get printed?
		`int main()`
		`{`
		`int x;`
			2	L1

```
int result3 = x - y - z;
printf("result3 = %d\n", result3);
int result4 = x++ * 2 + 3;
printf("result4 = %d\n", result4);

return 0;

}
```

Write a program to process and print Railway ticket for travelling from Chennai to Coimbatore. The ticket rates are given in table-1 as per the class.

Class	Rate
Second class	Rs. 100
Sleeper class	Rs. 200
3rd AC	Rs. 600
2nd AC	Rs. 900
1st class	Rs. 1300

The information taken from the passenger are (i) Name (ii) Age and (iii) class of travel.
The bill processing of the train ticket should be done as per the condition given below.

- The rates given in the table-1 is for passenger in the age group from 15 to 59. If the age of passenger is above 60, then 50% concession is applicable on the rate given. If the age of passenger is less than 5, then no charge. If the age of passenger is between 6-14, then 20% concession is applicable on the rate.
- If the passenger prefers Veg meal- Rs. 70/meal, Non-Veg meal – Rs. 100/meal is applicable.
- 18% GST is applicable from the total charge if and only if the passengers are travelling in 1st class, 2nd AC and 3rd AC.

After processing the bill, the tickets should be printed as per the format given below.

Date of Booking:			Date of Travel		
S,no	Passenger Name	Age	Class of Travel	Food Preference	Total Rate
				Total :	
				Total with GST:	

2   10   L4

		``for(x= -1; x<=10; x++)
{
if(x < 5)
continue;
else
break;
printf("Hello");
}
return 0;
}```		
5	a	Find the error in each of the following and correct it ```int g(void) {
printf("%s", Inside function g\n"); int h(void)
{
printf("%s", Inside function h\n"); }
}```	2	L3
	b	```int sum(int x, int y)
{
int result;
result = x + y;
}```	2	L3
	c	```void f(float a); {
float a;
printf("%f", a); }```	2	L3
	d	```int sum(int n) {
if (0 == n) {
return 0; //
}
else {
n + sum(n - 1); }
}```	2	L3
	e	```void product(void)
{
int a, b, c, result;
printf("%s", "Enter three integers: ") scanf("%d%d%d", &a,
&b, &c);
result = a * b * c;
printf("Result is %d", result);
return result;
}```	2	L3

********All the best ************

a	Find the error in each of the following and correct it
	
	``c
	int g(void) {
	printf("%s", Inside function g\n"); int h(void)
	{
	printf("%s", Inside function h\n"); }
	}
	``

b	```c
	int sum(int x, int y)
	{
	int result;
	        result = x + y;
	    }
	``

c	```c
	void f(float a); {
	float a;
	printf("%f", a); }
	``

d	```c
	int sum(int n) {
	if (0 == n) {
	return 0; //
	}
	else {
	n + sum(n - 1); }
	}
	``

e	```c
	void product(void)
	{
	int a, b, c, result;
	printf("%s", "Enter three integers: ") scanf("%d%d%d", &a,
	&b, &c);
	result = a * b * c;
	printf("Result is %d", result);
	return result;
	}
	``

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Continuous Assessment Test I – January 2025				
Programme	: B.Tech. (ECE) & B.Tech. (ECM)	Semester	:	Winter Sem 2024-25
Course Code & Course Title	: Cryptography and Network Security	Class Number	:	CH2024250501517
Faculty	Dr. T. Jayavignesh	Slot	:	A2 + TA2
Duration	: 90 Minutes	Max. Marks	:	50

Answer all questions

Q.No. Sub. Sec.	Questions	Marks	Bloom Taxonomy Level

1.

(i) Brief the three core goals of the CIA Triad in information security. **[3]**

      1

(ii) Discuss the relationship between security mechanisms and security services in the OSI security architecture. **[7]**

2.

(i) When the American patrol boat, under the command of Lieutenant John F. Kennedy, was sunk by a Japanese destroyer, a message was received at an Australian wireless station in Playfair code: **[7]**

KXJEY UREBE ZWEHE WRYTU HEYFS

KREHE GOYFI WTTTU OLKSY CAJPO

BOTEI ZONTX BYBNT GONEY CUZWR

GDSON SXBOU YWRHE BAAHY USEDQ

The key used was "royal new zealand navy".

Decrypt the message.

Note: Translate TT into tt.

      4

(ii) Bob received the following ciphertext from Alice
M T M T C M S A L H R D Y **[3]**
The cipher used is Auto key and the initial key value $k1 = 12$.
Decrypt the cipher and identify the what type of cipher this belongs to with justification.

3. (i) In a cryptographic algorithm, the key for a particular operation is [7] computed using modular exponentiation. You are given the base 3, the exponent 100, and the modulus 29. Compute the answer to this modular exponentiation problem using fast exponentiation.

(ii) Find the Euler's totient function $\varphi(32)$ and list the elements in the [3] set Z_{32}^{*}.

4. (i) Consider the set $Z_5 = \{0,1,2,3,4\}$ with addition and multiplication [7] modulo 5. Investigate if Z_5 is a field or a commutative ring. Justify by verifying the properties.

(ii) Find the multiplicative inverse of 11 in Z_{26} using extended Euclidean [3] algorithm

5. Illustrate with an example to satisfy how Diffusion & Confusion properties [10] are satisfied when applied in modern symmetric key cryptographic algorithm. Also showcase how Feistel cancelled the effect of non-invertible entities and made encryption/decryption inverse of each other?

VIT
Vellore Institute of Technology
CHENNAI

Continuous Assessment Test (CAT) – I – JANUARY 2025

Programme	:	B.Tech (CSE and its Specialization)	Semester	:	Winter Semester 2024-25
Course Code & Course Title	:	BCSE303L Operating Systems	Class Number	:	CH2024250502595 CH2024250502596
Faculty	:	Dr.M.Revathi Dr.Afruza Begum	Slot	:	B2+TB2
Duration	:	90 Minutes	Max. Mark		50

General Instructions:
- Write only your registration number on the question paper in the box provided and do not write other information.

Answer all questions

Q. No	Sub Sec.	Description	Marks
1		If you are part of a development team tasked with creating an operating system for the collection of home appliances. State and discuss the key functionalities should the operating system provide? Additionally, what design challenges need to be addressed during development in the perspective of security and protection?	10
2	a)	Suppose two processes P0 and P1 are running in system. During the execution of the task they have to undergo various CPU and I/O cycle and also change their states. Discuss the following in above context i. With the help of state transition diagram explain different states of process P0 and P1. **(3 marks)** ii. Give the role of PCB in this regards with neat diagram **(4 Marks)** iii. How to reduce context switch overhead ?**(3 marks)**	20
	b)	In a Unix based system, identify the system calls for process creation and maintenance. Write a C program using system calls that ensures rule 1 and 2, to create processes with the hierarchy shown below and print the process identifier **(10 marks)** Rule 1: Ensure that no zombie process should be created. Rule 2: No parent process id is printed before its child.	

| 3 | In a busy software development company, there are eight tasks that need to be completed by the team. The expected time to finish each task is as follows: 9 hours, 8 hours, 5 hours, 3 hours, 2 hours, 7 hours, 6 hours, and an unknown task that takes x hours (where $8<x<9$). The team decides to use the Shortest Job First (SJF) scheduling algorithm to optimize their workflow. After processing all eight tasks, they find that the average completion time for these tasks is 24 hours. What is the value of x? **(5 marks)** | 5 |

Assume you are managing the operations of a hospital emergency room where multiple patients need attention from doctor. Each patient is assigned a priority level based on the severity of their condition (higher numbers indicate higher priority). The doctor attends one patient at a time, and the hospital employs an interrupt-driven, time sliced approach to manage patient care fairly and efficiently. The following patients arrive at the hospital over time:

Patient ID	Priority	Expected Treatment Time (minutes)	Arrival Time (minutes)
P_1	50	30	0
P_2	40	35	35
P_3	40	35	40
P_4	45	25	70
P_5	15	20	150
P_6	20	20	155

Patients are treated based on a prioritization system, where those with higher priority (indicating more severe conditions) are attended first. The hospital employs a time-slicing approach, ensuring each patient receives 15 minutes of treatment before another patient is attended to, allowing for timely care for all. If no patients are waiting, doctors remain idle until a new patient arrives.

A. Show the scheduling order of the patients using a Gantt chart. **(6 Marks)**
B. Calculate the average turnaround time of patients. **(4 Marks)**
C. Calculate the average waiting time of patients. **(3 Marks)**
D. Calculate the doctor's utilization rate. **(2 Marks)**

(Row 4, marks: 15)

***********All the best *************

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Continuous Assessment Test (CAT) – I   JANUARY 2025

Programme	:	B.Tech. CSE and Specialization, B.Tech. Electronics and Computer Engineering	Semester	:	Winter 24-25
Course Code & Course Title	:	BCSE307L & Compiler Design	Class Number	:	CH2024250502560 CH2024250502563
Faculty	:	Dr. S. Kiruthika, Dr. Suganya R.	Slot	:	C2+TC2
Duration	:	90 MINUTES	Max. Mark		50

General Instructions:
- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks
1.		Examine the expression **f=a+b*c/d-e** using different phases of a compiler in detail with all the intermittent outcomes.	10
2.		Construct an automata for the regular expression **a*(b|a)*b**	10

3.	a.	Parse the string **aaabbba** from the grammar G = (V,T,P,A) where V={A,B}, T={a,b} and P ={
		 A → aBa | B | a,
		 B → aBb | b
		 }
		 using recursive descent parser. Narrate the issues faced in this method. (5 marks)
			10

	b.	Demonstrate the working of shift reduce parser for the string **(a-(a+(a-b)))** in the given grammar and highlight the conflicts. (5 marks) A → (B) | a B → B − A | A | B + A	
4.	a.	Check whether the given grammar is LL(1) parser or not, justify. A → B$ B → bAb | D C → aCa | D D → dCd | wBw | λ (7 marks)	10

	b.	Check whether the string **bdaadb** can be parsed with the above parsing table or not. (3 marks)	
5.		Evaluate the string **a+a^a** with a following grammar G using an operator precedence parsing table with an appropriate data structure. Productions in the grammar G are: A → A+B|B B → B^C | C C → a	10

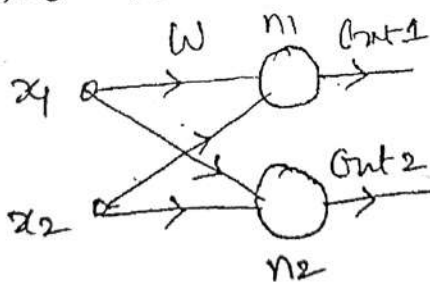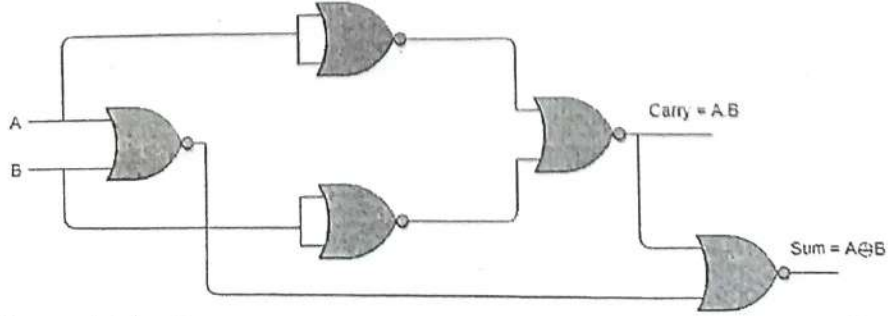**********All the best **************

VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test II – October-2024

Programme	: B.Tech (ECE/ECM/VLSI)	Semester	:	WS 2024-25
Course	: Deep Learning	Code	:	BCSE332L
		Class Nbr	:	CH2024250501498
		Slot	:	E2+TE2
Faculty	: Dr. R. Vijayarajan	Max. Marks	:	50
Time	: 90 Minutes			

Answer ALL the questions

| Q.No.	Sub. Sec.	Questions	Marks	BT Level
1.	(i)	Derive the expression for Gradient descent $\left(\Delta w_k = -\epsilon \frac{\partial E}{\partial w_k}\right)$ with sigmoid neurons.	6	L1
	(ii)	Also discuss the need for stochastic and minibatch gradient descent algorithms	4	
2.		Evaluate out1 and out2 of the given neural network using the following activation functions (i) Sigmoid (ii) Tanh (iii) ReLu (iv) Softmax $$X = \begin{bmatrix} 2 \\ 3 \end{bmatrix}; W = \begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}; b = 1$$	10	L2
3.		Draw the network graphs using Multilayer perceptron network for a 2-bit adder and a subtractor using NOR gate. Figure: 2-bit adder	10	L2
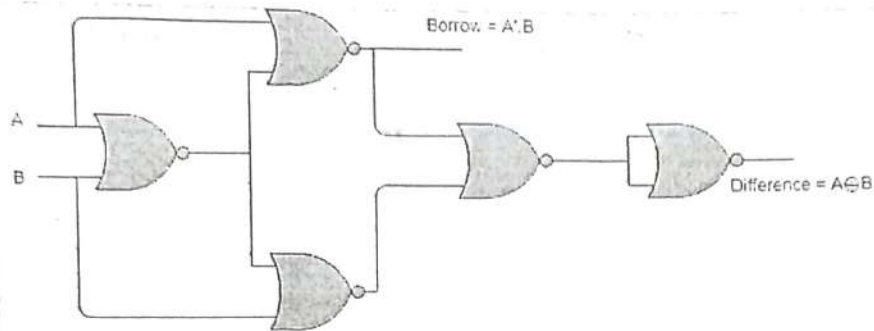
Figure: 2-bit subtractor

Perform convolution for the given input $I(x,y)$ with stride1 and stride2. The kernel matrix is $g = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$. For the output of convolution with stride1, apply max pooling of size (2, 2) with stride 1. There is no padding involved during convolution and max pooling.

4.   10   L2

$$I(x,y) = \begin{bmatrix} 1 & 2 & 3 & 1 & 2 \\ 3 & 4 & 2 & 1 & 0 \\ 5 & 3 & 2 & 1 & 1 \\ 1 & 2 & 1 & 5 & 3 \\ 2 & 1 & 1 & 0 & 5 \end{bmatrix}$$

Evaluate activation maps and parameters of various layers of AlexNet for 1000 classes. The specifications of AlexNet architecture are given in Table 1. Analyse the impact of max pooling on classification and segmentation.

Table 1 AlexNet Architecture

5.

Layer	filters	Size	Stride, padding	Activation maps	Parameters
Input	-	-	-	227 × 227 × 3	
Conv1	96	11 × 11	4, 0		
Max pool1	-	3 × 3	2		
Conv2	256	5 × 5	1, 2		
Max pool2	-	3 × 3	2		
Conv3	384	3 × 3	1, 1		
Conv4	384	3 × 3	1, 1		
Conv5	256	3 × 3	1, 1		
Max pool3	-	3 × 3	2		
FC6	-	-	-	9216	
FC7	-	-	Drop out=0		
FC8 with softmax	-	-	-	1000	

10   L2

⇔ ⇔ ⇔   Course Faculty

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Continuous Assessment Test(CAT) – I /II - JAN 2025

Programme	:	B.Tech ECE, ECM	Semester :	WS 2024-25
Course Code & Course Title	:	BECE406E FPGA-Based System Design	Class Number :	CH2024250501374 CH2024250501383
Faculty	:	Dr. Velmathi G Dr. Jean Jenifer Nesam J	Slot :	F2
Duration	:	90 Minutes	Max. Mark	50

General Instructions: < Use this space to provide additional information such as graph sheet, data book etc.>
- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	Blooms Taxonomy Level
1		Explain the three primary FPGA programming technologies—SRAM-based, flash-based, and antifuse-based. Compare their architecture, programming mechanism, reprogrammability, power efficiency, and typical use cases. Which technology would you recommend for highly reliable and low-power consumption applications? Justify your answer	[10]	L3 & L4
2	a.	$F(a,b,c,d)=a'+ac'd'+b'cd'+ad$ (i) Realize the function using 4-variable LUTs and a 2-to-1 MUX. specify the LUT mask bits (4 Marks) (ii). Provide the truth table for LUT (2 Marks) (iii). Give a summary of the resources used. (2 Marks)	[8+7]	L3
	b.	Implement the following logic using PLA (7 Marks) $f1 = \Sigma m(3,4,6,9,11)$ $f2 = \Sigma m(2,4,8,10,11,12)$ $f3 = \Sigma m(3,6,7,10,11)$		
3	a.	The following code is intended to generate a clock signal with a 50% duty cycle. Without running the code, predict if it will work as intended. If not, explain the issue and suggest a correction. module clock_gen (clk_in, clk_out); input clk_in; output reg clk_out; always @(posedge clk_in) clk_out <= ~clk_out; endmodule	[5+5]	L3 & L4

		Analyze the following Verilog code snippet. Predict the		
	b.	output behaviour of q and q_bar for a series of clock pulses and provide an explanation

```
module latch (clk, d, q, q_bar);
        input clk, d;
        output reg q, q_bar;

        always @(clk or d)
        begin
        if (clk) begin
        q <= d;
        q_bar <= ~d;
        end
        end
endmodule
``` | | |
| 4. | | (i). To perform addition on three 8-bit binary values, design a digital adder in which the carry is kept and added later in a final carry-propagate adder rather than propagating directly along the chain. (5 Marks)

(ii). Examine its benefits, structure, and operation in depth compared to conventional ripple carry addition. (4 Marks)

(iii). Write the Verilog code for the design mentioned in (i) using gate level coding style (6 Marks) | [15] | L7 |

**********All the best *************

VIT®

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test I – January- 2025

Programme	:	B.Tech. (ECE, ECM & EEE)		Semester	:	WS 2024-25
Course	:			Code	:	BECE320E
		Embedded C Programming		Class Nbr	:	CH2024250501284
						CH2024250501236
						CH2024250501286
						CH2024250501274
						CH2024250501271
Faculty	:	Dr.S. REVATHI Dr. JEETASHREE APARAJEETA Dr. R. DHANUSH Dr. BALAKRISHNAN Ms. KRITHIKA ALIAS ANBUDEVI		Slot	:	G2
Time	:	90 Minutes		Max. Marks	:	50

Answer <u>ALL</u> the questions

Q.No.	Sub. Sec.	Questions	Marks	BT Level
1.		Find the output for each of the code snippet and write as how it is displayed.		
	(i)	```int main()
{
int x = 10;
printf("%d\n %d\n %d\n", x, ++x, x++);
return 0;
}``` (2 marks)		
	(ii)	```int main()
{
int x = 3, y=1;
int z = (y++) ? 2 : y == 1 && x ;
printf("\n %d\t %d", z--, z);
return 0;
}``` (2 marks)	10	L2
	(iii)	```int main()
{
char arr[] = "Hello";
char *p = arr;
++*p;
printf(" %c", *p);
return 0;
}``` (2 marks)		

(iv)

```
int main()
{
int a = 5, b=4, c =2;
b != !a;
c = !!a;
printf("%d\t%d", b, c);
return 0;
}   (2 marks)
```

(v)

```
int main()
{
int n=50;
printf("We\nare \b learning only %d\%\t\"C\" programming  here \'in\' CAT1",
n);
return 0;
}   (2 marks)
```

| 2. | Write a C program that takes an n-digit number as input (where n ranges from 4 to 8) and performs the following tasks: | 10 | L3 |

Write a C program that takes an n-digit number as input (where n ranges from 4 to 8) and performs the following tasks:

(i)   Find the prime digits present in the number.
(ii)   Find the position of the prime digit in the 'n' digit number.
(iii)   Create a new n-digit number where:

- Positions corresponding to prime digits are set to 1.
- Other positions are set to 2.

(iv)   Print the positions of the prime digits and the new n-digit number.

Ex:

If the numbers 4754638, then

Positions of prime digits are 2, 5, 6.

New n-digit number is 2112212.

3.	(a)	Write a C program to check whether a given railway seat number is valid. If valid, determine the type of berth it corresponds to. The types of berths are categorized based on the given seating arrangement (refer to the figure below). (6 marks)		

Upper berth →	3	6	11	14	19	22	27	30	35	38	43	46	51	54	59	62	67	70
Middle berth →	2	5	10	13	18	21	26	29	34	37	42	45	50	53	58	61	66	69
Lower berth →	1	4	9	12	17	20	25	28	33	36	41	44	49	52	57	60	65	68
Side lower berth →	7	8	15	16	23	24	31	32	39	40	47	48	55	56	63	64	71	72

Side upper berth

(b) Analyze the following program and determine its output. (2 marks)

```
int main()
{
int a = 500, b = 100, c;
if(!a >= 400)
b = 300;
c = 200;
printf("b = %d c = %d\n", b, c);
return 0;
}
```

(c) How many times loop will execute? (2 marks)

```
int main()
{
int j=1;
while(j <= 255)
{
printf("%c %d\n", j, j); j++;}
}
```

4.	Write a C program that stores the temperatures recorded over 7 days in an array and display the following. (i) Maximum and minimum temperatures of the week (ii) Average temperature for the week. (iii) All the days when the temperature was above average.	10	L2
5.	Figure 1 illustrates the setup of a chemical mixer plant in a chemical industry. The controller plays a critical role in ensuring that the parameters essential for optimal chemical mixing are maintained. These parameters include the pressure and volume within the mixer, as well as the flow rate at the mixer's outlet.	10	L3

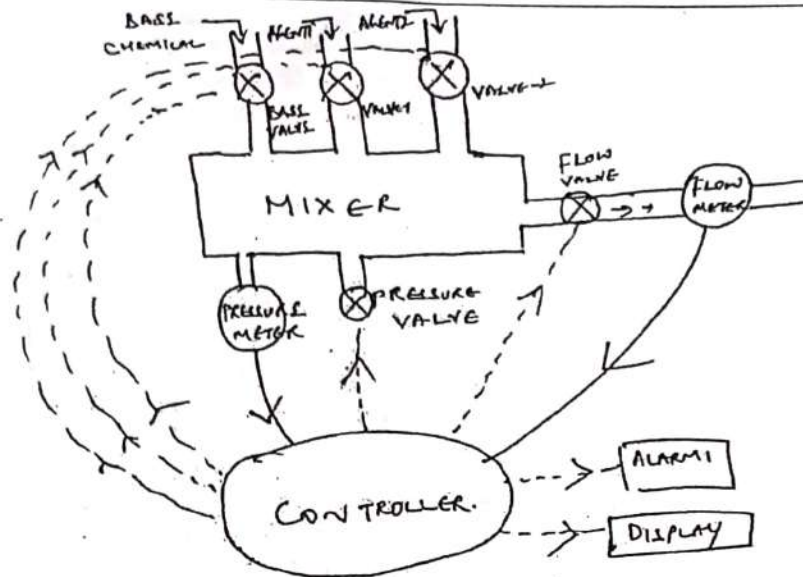(Question 3 total marks: 10, L2)

Fig-1

The controller will continuously monitor the pressure meter and flow meter attached to the mixer and controls the opening and closing of Valve-1, Valve-2, Pressure – Valve, Flow-Valve and also trigger alarm in emergency, Display the current status of the parameter.

Write a C program for the controller with the following conditions.

- The controller should run indefinitely
- The pressure and flow measuring and controlling should be done as a separate functions.
- Valve-1 and Valve-2 are digital so, valve open = 1 and valve close = 0.
- Pressure-Valve and Flow-Valve are analog and can be opened and closed from 1 to 0 in the range of 0.1. (i.e 0, 0.1, 0.2...1)
- The controller is the main function that starts the mixer, by initially opening the base chemical valve and agent-1 Valve (Valve-1) for 10 units and then agent-2 Valve (Valve-2) for 1 unit. All the three valves are closed that will start mixing process.
- The controller will monitor the pressure (P) meter and calculate volume (V). P & V are related with equation
  $$PT = 1.2 \ X \ 10^9 \ .$$
- If volume is less than 2000 unit, then pressure valve should be opened gradually from 0 to 1 with a delay. If volume is greater than 10000 unit then alarm should be triggered.
- The controller also monitor the flow meter (F) and if 'F' is between 0.2 to 0.5 then normal flow, 'F' is greater than 0.5; then flow value should be gradually closed from 1 to 0, only till flow meter reads less than 0.5. If 'F' is less than 0.05 then the mixer will stop and the base chemicals and agent-1 and agent-2 will be fed as initial steps.
- The display unit should display the current value as per format given below.

Parameter	Value
Status of Valve-1	---
Status of Valve-2	---
Status of pressure –Valve	---
Status of Flow-Valve value	
Pressure inside mixer	
Volume inside mixer	

⇔⇔⇔