

(Please write your Enrolment No. immediately)

Enrolment No. _____

MID TERM EXAMINATION
B.TECH PROGRAMMES (UNDER THE AEGIS OF USICT)

V Semester, November, 2023

Paper Code: CIC-305

Subject: Operating Systems

Time: 1½ Hrs.

Max. Marks: 30

Note: Attempt Q. No. 1 which is compulsory and any two more questions from remaining.

Q. No.	Questions	Max. Marks	CO(s)																				
1 (a)	How multiprogramming differs from multitasking?	2	CO1																				
(b)	Differentiate between internal and external fragmentation.	2	CO1																				
(c)	Explain logical and physical address space in paging.	2	CO1																				
(d)	What are various scheduling criteria for CPU scheduling?	2	CO2																				
(e)	What is busy waiting? How to overcome busy waiting using semaphore operations	2	CO2																				
2 (a)	Consider following page reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 How many page faults would occur for LRU and Optimal page replacement algorithm assuming 3 frames and all frames are initially empty.	5	CO1																				
(b)	What is cause of thrashing? What steps are taken to eliminate this problem?	5	CO1																				
3 (a)	What is critical section problem? Explain three conditions that must satisfy to provide solution to critical section problem	5	CO2																				
(b)	What is Dining Philosophers problem? Discuss solution to Dining Philosopher's problem using semaphores.	5	CO2																				
4 (a)	Define Process? Explain various states of process with suitable diagram	5	CO2																				
(b)	Consider the following process: <table><tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th><th>Priority</th></tr><tr><td>P1</td><td>0</td><td>6</td><td>3</td></tr><tr><td>P2</td><td>1</td><td>4</td><td>1</td></tr><tr><td>P3</td><td>2</td><td>5</td><td>2</td></tr><tr><td>P4</td><td>3</td><td>8</td><td>4</td></tr></table> <p>Draw Gantt chart and find the average waiting time and average turnaround time: (i) SRTF Scheduling (ii) Round robin (time quantum:3)</p>	Process	Arrival Time	Burst Time	Priority	P1	0	6	3	P2	1	4	1	P3	2	5	2	P4	3	8	4	5	CO2
Process	Arrival Time	Burst Time	Priority																				
P1	0	6	3																				
P2	1	4	1																				
P3	2	5	2																				
P4	3	8	4																				

Student Name:

Enrollment No:

Mid-Term Examination – November 2023

Programme: B.Tech (AI-DS/AI-ML/IOT)

Paper Code: AIDS-307/AIML-307/IOT-307

Time: 1½Hrs.

Semester: Fifth Semester (Aug. 2023 - Dec 2023)

Paper Name: Computer Organization and Architecture

Maximum Marks: 30

Note:

- Question No. 1 is compulsory.
- Attempt any two questions from the remaining questions.
- Some questions have internal choice also.
- All questions carry equal marks.
- Only scientific calculator is allowed.

Question 1			
1(a)	Differentiate between "hit" and "miss" with respect to cache memory	Marks	CO
1(b)	With the help of a flow chart explain how the interrupts are handled.	[2.5]	2
1(c)	Differentiate between direct and indirect instructions.	[2.5]	1
1(d)	Explain what is virtual memory and what is meant by locality of reference.	[2.5]	2
Question 2			
2(a)	<p>Represent the following conditional control statement by two register transfer statements with control functions. If ($P = 1$) then ($R1 \leftarrow R2$) else if ($Q = 1$) then ($R1 \leftarrow R3$) and draw the block diagram representation for the same.</p> <p style="text-align: center;">OR</p> <p>Register A holds the 8-bit binary 11011001. Determine the B operand and the logic microoperation to be performed in order to change the value in A to:</p> <p>i. 01101101 ii. 11111101</p>	[4]	1
2(b)	<p>A computer uses a memory unit with 512K words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has four parts: an indirect bit, an operation code, a register code part to specify one of 128 registers, and an address part.</p> <p>i. How many bits are there in the operation code, the register code part, and the address part? ii. Draw the instruction word format and indicate the number of bits in each part. iii. How many bits are there in the data and address inputs of the memory?</p>	[6]	1
Question 3			
3(a)	<p>Explain zero address, one address, two address and three address instructions with the help of an example.</p> <p style="text-align: center;">OR</p>	[4]	2

	Convert the following numerical arithmetic expression into reverse Polish notation and show the stack operations for evaluating the numerical result. $(3 + 4)[10(2 + 6) + 8]$		
3(b)	In detail explain the three different formats for cache mapping.	[6]	2
Question 4			
4(a)	A computer uses RAM chips of 1024×1 capacity. i. How many chips are needed, and how should their address lines be connected to provide a memory capacity of 1024 bytes? ii. How many chips are needed to provide a memory capacity of 16K bytes? Explain in words how the chips are to be connected to the address bus.	[4]	2
4(b)	The 8-bit registers AR, BR, CR, and DR initially have the following values: AR = 11110010, BR = 11111111, CR = 10111001, DR = 11101010, Determine the 8-bit values in each register after the execution of the following sequence of microoperations. i. $AR \leftarrow AR + BR$ (Add BR to AR) ii. $CR \leftarrow CR \wedge DR$, $BR \leftarrow BR + 1$ (AND DR to CR, increment BR) iii. $AR \leftarrow AR - CR$ (Subtract CR from AR)	[6]	1

--XXX--

Mid-Term Examination – November 2023

programme: B.Tech (AI & ML)

Semester: Fifth Semester

paper Code: AIML305

Paper Name: Fundamentals of Deep Learning

Time: 1½Hrs.

Maximum Marks: 30

Note:

- Question No. 1 is compulsory.
- Attempt any two questions from the remaining questions.
- Some questions have internal choice also.
- All questions carry equal marks.
- Only scientific calculator is allowed.

Question 1		Marks	CO
1(a)	Which one is Euclidean norm (i) L1 norm (ii) L2 norm (iii) MSE (iv) $\ x\ = \sum_i x_i $	[1]	CO1
1(b)	Draw McCulloch–Pitts unit and calculate output.	[2]	CO1
1(c)	Evaluate Exploding gradient with one example.	[3]	CO1
1(d)	Differentiate between Shallow Learning Vs Deep Learning with one example.	[3]	CO1
1(e)	Describe the MAE with regression problem.	[1]	CO2
Question 2			
2(a)	Classify and elaborate different loss functions used in deep learning.	[5]	CO2
2(b)	Name different optimizers used in deep learning. Also examine “Adam” optimizer with their required equations.	[5]	CO2
Question 3			
3	(i) Difference Between Gradient descent, Stochastic Gradient Descent, and Mini-batch Gradient Descent.	[6]	CO2
	(ii) Find the output of Single Layer Neural Network with two inputs (x_1, x_2), two neurons in hidden layer and Relu activation function at each neuron with random weights and bias. Show the steps to apply Stochastic Gradient Descent in any weight.	[4]	
	Or	[6]	
	(i) List and explain various practical and design issues of back propagation learning. (ii) What is the role of synapse in biological neuron? Discuss and Define perceptron and its structure.	[4]	
Question 4			
4	(i) Justify why there is a rising trend of deep learning. (ii) Explain chain rule with respect to deep learning.	[5] [5]	CO2

--XXX--

Mid-Term Examination – Nov 2023

Programme: B.Tech (AI&DS) / AI&ML
Paper Code: AIDS 309 / AI&ML-309
Time: 1½Hrs.

Semester: 5th Semester

Paper Name: Introduction to Internet of Things

Maximum Marks: 30

Note:

Question No. 1 is compulsory.
Attempt any two questions from the remaining questions.
Some questions have internal choice also.
All questions carry equal marks.

Question 1

		Marks
1(a)	What is the Internet of Things (IoT), and why is it important in today's technological landscape?	[2.5]
1(b)	What are the key functions of actuators in IoT systems, and how do they differentiate from sensors in their roles and capabilities.	[2.5]
1(c)	What is a transducer?	[2]
1(d)	What is the use of ESP8266? And also explain its three modes of connection.	[3]

Question 2

2(a)	What is the logical design of IoT devices?	[5]
2(b)	What physical design elements are important for IoT-based smart agriculture system, and how do they optimize crop management?	[5]

Question 3

3(a)	Write an Arduino program to blink LED light.	[5]
3(b)	Discuss the static and dynamic characteristics of sensors.	[5]

Question 4

4(a)	Imagine a situation where a smart home automation system is facing challenges with its request-response communication model. The system comprises various IoT devices such as smart thermostats, lights, and security cameras, all connected to a central control hub. However, users have been experiencing delays and inconsistencies in controlling devices remotely through the mobile app. List out the issues with the model and suggest alternative communication models or protocols that might better address these challenges.	[5]
4(b)	What are Communication Protocols? Discuss UART Protocol and I2C Protocols.	[5]

Enrollment No:.....

Mid-Term Examination – Nov 2023

Programme: B.Tech (AI&ML/AI&DS/IIoT)
Paper Code: AIDS 311/AIML 311/ IOT311
Time: 1½Hrs.

Semester: 5th Semester
Paper Name: Principles of Entrepreneurship Mindset
Maximum Marks: 30

Note:

- Question No. 1 is compulsory.
- Attempt any two questions from the remaining questions.
- Some questions have internal choice also.
- All questions carry equal marks.

	Question 1	Marks
1(a)	Explain 'Entrepreneurship'?	[2]
1(b)	Define 'Intrapreneur'?	[2]
1(c)	Discuss the term 'Social Entrepreneurship'?	[2]
1(d)	What do you mean by 'Angel investors'?	[2]
1(e)	What is the meaning of 'Game changers'?	[2]
Question 2		
2(a)	What are the key characteristics of successful entrepreneurs?	[3]
2(b)	When an Idea does qualify to become a good business opportunity?	[3]
2(c)	Explain the various types of Innovation with suitable examples?	[4]
Question 3		
3(a)	What do you mean by 'Business Model Canvas'?	[3]
3(b)	Discuss in brief 'Building Blocks' of the Business Model Canvas i.e. 'Distribution Channels' & 'Key Partnerships', with suitable examples.	[4]
3(b)	Explain the term 'Business Problem statement' along with suitable example?	[3]
Question 4		
4(a)	List out the problems faced and strategies adopted by the Founder/s of any Startup in Computing?	[5]
4(b)	Highlight the financial achievement and future aspects in respect of any Startup.	[5]

Mid-Term Examination – November 2023

Programme: B. Tech (AI & DS, AI & ML, IIOT)

Paper Code: AIDS-303/AIML-303

Time: 1½ Hours

Semester: Fifth (September, 23 – January, 24)

Paper Name: Design and Analysis of Algorithm

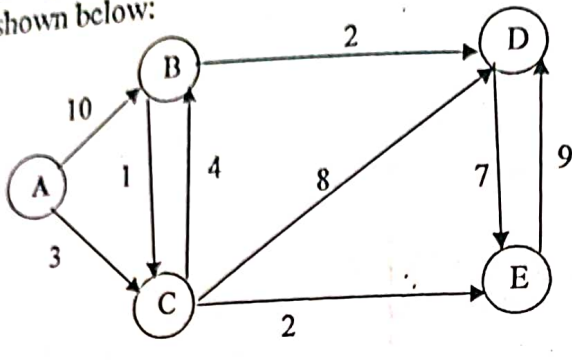
Maximum Marks: 30

Note: Q. No. 1 is compulsory. Attempt any two questions from the remaining questions. Some questions have internal choice also. All questions carry equal marks. Only scientific calculator is allowed.

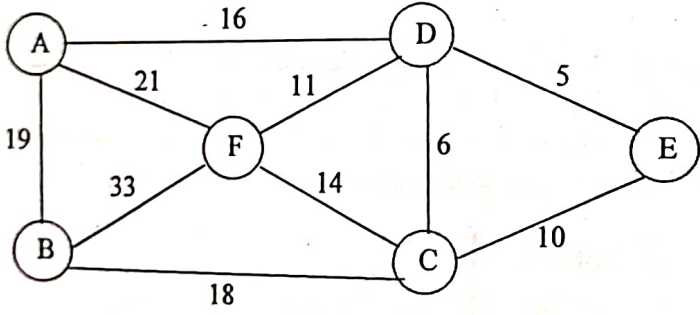
Question 1 (Attempt any Five)		
1(a)	Find the order of the function $f(n) = \log(n!)$ in big Oh notation.	Marks [2]
1(b)	In Strassens' matrix multiplication, what is the formula to calculate the element present in the second row, first column of the product matrix?	[2]
1(c)	Find the time complexity for algorithm to find the number of bits in binary representation of a decimal number n. (Example decimal number 9 is represented in binary by 1001 i.e. 4 bits)	[2]
1(d)	A machine needs a minimum of 200 seconds to sort 1024 elements by Quick Sort. Approximately what will be the minimum time required to sort 512 elements?	[2]
1(e)	We have a list of pairs [("Ashwin", 69), ("Sumati", 87), ("Tanuja", 69), ("Brinda", 87), ("Shabana", 72), ("Vijay", 60)], where each pair consists of a student's name and his/her marks in a course. We sort these pairs in ascending order of marks. What will be the corresponding output to a stable sort?	[2]
1(f)	Explain fractional knapsack problem.	[2]
1(g)	Solve the recurrence $T(n) = 2T(n/2) + n^2$ using recurrence tree method.	[2]
Questions 2		
2(a)	(i) Solve the following recurrence relation using Master's theorem $T(n) = 2T(n/4) + n^{0.51}$	[5]
	(ii) Calculate the time complexity for Towers of Hanoi. It consists of three pegs A, B and C. Move n disks from A to B, Never put a larger disk above a smaller one and C is transit peg.	[5]
OR		

2(b)	(i) Let r_n be the number of n -bit strings that do NOT contain two consecutive 1's. Find the recurrence relation for r_n ? [5]
	(ii) Compute the time complexity of insertion sort and perform the insertion sort to sort the following numbers [27, 19, 33, 15, 4] [5]

Question 3

3(a)	<p>(i) Illustrate Dijkstra's Algorithm for finding the shortest path from A in the graph shown below: [5]</p>  <pre> graph LR A((A)) -- 10 --> B((B)) A((A)) -- 3 --> C((C)) B((B)) -- 2 --> D((D)) B((B)) -- 1 --> C((C)) C((C)) -- 8 --> D((D)) C((C)) -- 2 --> E((E)) D((D)) -- 9 --> E((E)) E((E)) -- 7 --> D((D)) </pre> <p>(ii) What is the optimal Huffman code for the following set of frequencies: [5]</p> <p>a: 0.25, b: 0.1, c: 0.2, d: 0.15, e: 0.26, f: 0.04</p>
------	--

OR

3(b)	<p>(i) Construct a minimum spanning tree using Prim's algorithm for the graph shown below: [5]</p>  <pre> graph LR A((A)) --- 19 B((B)) A((A)) --- 16 D((D)) A((A)) --- 21 F((F)) B((B)) --- 18 C((C)) B((B)) --- 33 F((F)) C((C)) --- 6 D((D)) C((C)) --- 10 E((E)) C((C)) --- 14 F((F)) D((D)) --- 5 E((E)) F((F)) --- 11 D((D)) </pre> <p>(ii) Perform the heap sort to sort the following numbers. [5]</p> <p>4, 10, 3, 5, 1</p>
------	--

End