

Mid-Term Examination – November 2023**Programme: B.Tech (AI-DS/AI-ML/IOT)****Paper Code: AIDS-307/AIML-307/IOT-307****Time: 1½ Hrs.****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	Marks	CO
1(a)	Differentiate between "hit" and "miss" with respect to cache memory	[2.5]	2
1(b)	With the help of a flow chart explain how the interrupts are handled.	[2.5]	1
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)	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. OR 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: i. 01101101 ii. 11111101	[4]	1
2(b)	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. 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?	[6]	1

Question 3

3(a)	Explain zero address, one address, two address and three address instructions with the help of an example. OR	[4]	2
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	Convert the following numerical arithmetic expression into reverse Polish notation and show the stack operations for evaluating the numerical result.		
3(b)	$(3 + 4)[10(2 + 6) + 8]$ In detail explain the three different formats for cache mapping.	[6]	2
	Question 4		CO
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

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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

	Question 1	Marks	CO
I(a)	Which one is Euclidean norm (i) L1 norm (ii) L2 norm (iii) MSE (iv) $\ x\ = \sum_i x_i $	[1]	CO1
I(b)	Draw McCulloch-Pitts unit and calculate output.	[2]	CO1
I(c)	Evaluate Exploding gradient with one example.	[3]	CO1
I(d)	Differentiate between Shallow Learning Vs Deep Learning with one example.	[3]	CO1
I(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. (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.	[6]	CO2
	Or (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]	
4		[6]	
4		[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]	CO2
		[5]	

Roll No:.....

Mid-Term Examination – Nov 2023

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

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

	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/IoT)
Paper Code: AIDS 311/AIML 311/ IOT311
Time: 1½ Hrs.

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]

(Please Write Your Enrolment. No. Immediately)

Student Name.....

Enrolment No.....

Mid Term Examination- NOV. 2023

Programme: B. Tech (AI&DS)

Semester V

Paper Code: AIDS 305

Subject: Data Mining

Time: 1.5 hours

Max. Marks: 30

Note:

- Q. No. 1 is compulsory. Attempt any two questions from the remaining questions.
- All Questions carry equal marks.

Question 1.			
	Marks	CO	BL
1(a) Define Data Mining? List the major issues in data mining?	[2.5]	1	1
1(b) Explain holdout method or Cross Validation used in evaluating Classification Performance?	[2.5]	2	2
1(c) Write a brief note on data discretization or aggregation?	[2.5]	1	1
1(d) Write a brief note on the pattern evaluation or Multiclass problem?	[2.5]	2	1

Question 2.			
	Marks	CO	BL
2(a) Explain Data Pre-processing techniques with example? Also discuss the role of data mining in research, business and marketing? or	[10]	1	2
2(b) Explain the differences between "Explorative Data Mining" and "Predictive Data Mining". Give one example of each. Also describe the four stages of knowledge discovery (KDD).	[10]	1	2.4

Question 3.			
	Marks	CO	BL
3(a) Why naïve Bayesian classification is called naïve? Briefly outline the major ideas of naïve Bayesian classification. Also Explain Bagging and Boosting. or	[10]	2	1.5
3(b) Explain briefly the differences between "classification" and "clustering" and give an informal example of an application that would benefit from each techniques. Describe the essential features of decision trees in context of classification.	[10]	2	2.4

Question 4.			
	Marks	CO	BL
4(a) Describe the architecture of Data Mining with a neat diagram? Explain measures of similarity and dissimilarity. or	[10]	1	2
4(b) Explain the process of multi layer feed forward neural network classification using backpropagation learning. Describe the ensemble methods?	[10]	2	2

END

Total No. of Pages: 02

Student Name

Enrollment No.

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)		Marks
1(a)	Find the order of the function $f(n) = \log(n!)$ in big Oh notation.	[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]

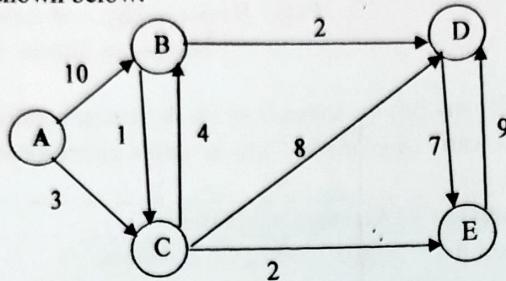
OR

Turn the page over

- 2(b)
- 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]
 - 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) (i) Illustrate Djiskstra's Algorithm for finding the shortest path from A in the graph shown below: [5]

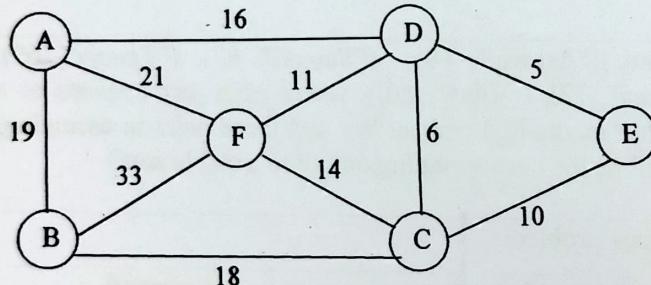


- (ii) What is the optimal Huffman code for the following set of frequencies: [5]

a: 0.25, b: 0.1, c: 0.2, d: 0.15, e: 0.26, f: 0.04

OR

- 3(b) (i) Construct a minimum spanning tree using Prim's algorithm for the graph shown below: [5]



- (ii) Perform the heap sort to sort the following numbers. [5]

4, 10, 3, 5, 1

End

Mid-Term Examination - November 2023

Programme: B.Tech (IOT)

Subject Code: IOT 305

Duration: 1½ Hrs.

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

Paper Name: Sensor and Control Systems

Maximum Marks: 30

Note:

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

Question 1**Marks**

I(a)	Classify transducers.	[2]
I(b)	Compare between Physical and Chemical Vapour Deposition.	[2]
I(b)	Define piezo-electric effect.	[2]
I(c)	On which fundamental principle does an Ultrasonic flow meter operate to measure the flow rate of a fluid? OR What makes a smart sensor different from a regular sensor?	[2]
I(d)	Draw the functional block diagram of the Measurement System.	[2]

Question 2

I(a)	State the various static and dynamic characteristics of transducers. OR A metallic strain gauge has a resistance of 120Ω and a gauge factor of 2. It is installed on an aluminium structure which has a yield point stress of 0.2 GN/m^2 and Young's modulus of 68.7 GN/m^2 , determine the change in resistance of the gauge that would be caused by loading the material to yield point.	[5]
I(b)	Discuss the principle of operation of LVDT. Also, state its advantages and disadvantages.	[5]

Question 3

What are the challenges involved while interfacing smart sensors in different applications?

OR

[5]

3(a)

With the help of a block diagram, illustrate the components and their interactions in a typical smart sensor system.

[5]

3(b)

How does the Sol-gel process work, and what are the key steps involved in this method of creating thin films or nanoparticles.

Question 4

4(a)

Obtain the expression for the voltage sensitivity of a piezoelectric crystal used for measurement of force.

[5]

4(b)

Write short notes on the following:

- i) Screen Printing
- ii) D.C. Tachogenerators

OR

[5]

Derive the expression of the output voltage under ideal conditions for a linear resistive potentiometer.

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Total No. of Pages:

Student Name:

Enrollment No:

programme: B.Tech (IOT)

Paper Code: IOT-301

Time: 1½ Hrs.

Mid-Term Examination - November 2023

Semester: Fifth Semester (Aug 2023 - Jan 2023)

Paper Name: Data Transmission Methodologies

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.

Q.No.	Question 1	Marks	CO
1(a)	Explain time-variant and time-invariant systems with examples.	[2]	1
1(b)	Write the limitations of analog communication system.	[3]	1
1(c)	A 10K watt carrier is amplitude modulated by two sine waves to a depth of 0.5 and 0.6 respectively. Calculate total power of modulated carrier.	[3]	2
1(d)	Write Carson's rule to calculate bandwidth of FM wave.	[2]	2
Question 2			
2	(a) Draw the block diagram of electronic communication system and state the function of each block. OR (b) Describe Energy and Power theorem. Find the energy and power of following signals: (i) $x(n) = (1/2)^n u(n)$ (ii) $x(n) = u(n) - u(n-5)$	[10]	1
Question 3			
3	(a) With a neat block diagram, explain the followings: (i) Synchronous detection for SSB-SC (ii) Phase-shift method of AM SSB-SC generation OR (b) With a neat block diagram, explain Armstrong's method of FM generation.	[10]	2
Question 4			
4	(a) Explain digital modulation techniques. Discuss what are the advantages of digital signal over analog signal? OR (b) An AM transmitter radiates 9kW of power when the carrier is unmodulated and 10.125kW of power when the carrier is sinusoidal modulated. Find the modulation index & percentage modulation. Now if another sine wave corresponding to 40% modulation is transmitted simultaneously. Calculate total radiated power.	[10]	2

Programme: B.Tech (IOT)

Paper Code: IOT 309

Time: 1½ Hrs.

Mid-Term Examination - November 2023

Semester: Fifth Semester

Paper Name: Machine Learning

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.

Q. No.		Question 1																
		Marks	CO															
1(a)	Differentiate Bagging and Boosting techniques.	[2.5]	1															
1(b)	List the basic design issues to Machine Learning.	[2.5]	1															
1(c)	Why Random Forest is preferred over Decision Tree?	[2.5]	2															
1(d)	Differentiate Bias and Variance.	[2.5]	1															
Question 2																		
2(a)	Differentiate Feature Selection and Feature Extraction techniques. OR Differentiate Over fitting and Under fitting with example.	[5]	1															
2(b)	Consider the data from a Survey to determine the quality of a metal. Classify a new metal with $X_1=3$ and $X_2=7$ using KNN algorithm (with $K=3$) <table border="1"> <thead> <tr> <th>X1 (Durability)</th> <th>X2 (Strength)</th> <th>Y (Classification)</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>7</td> <td>Bad</td> </tr> <tr> <td>7</td> <td>4</td> <td>Bad</td> </tr> <tr> <td>3</td> <td>4</td> <td>Good</td> </tr> <tr> <td>1</td> <td>4</td> <td>Good</td> </tr> </tbody> </table>	X1 (Durability)	X2 (Strength)	Y (Classification)	7	7	Bad	7	4	Bad	3	4	Good	1	4	Good	[5]	4
X1 (Durability)	X2 (Strength)	Y (Classification)																
7	7	Bad																
7	4	Bad																
3	4	Good																
1	4	Good																
Question 3																		
3	Discuss various steps of developing a learning system for playing Checkers. OR Derive the expression of cost function for a Support Vector Classifier	[10]	3															
Question 4																		
4	Write a note on any Two: (i) Outlier Detection Techniques (ii) Supervised and Unsupervised Learning (iii) Naïve Bayes	[5+5]	1															