Roll No. | | | | | | | | 174

EVEN END SEMESTER EXAMINATION 2024

Name of the Course: B.Tech

Semester: 8th

Name of the Paper: Soft Computing

Paper Code: TCS-821

Time: 3 Hours

Maximum Marks: 100

Note: -

(i) All questions are compulsory.

(ii) Answer any two sub-questions among a, b & c in each main question.

(iii) Total marks in each main question are twenty.

(iv) Each question carries 10 marks.

Q1	(20marks)	**CO1**
(a)	Compare and contrast biological neurons and artificial neurons	
(b)	Differentiate between supervised learning and unsupervised learning	
(c)	Compare feed forward and feedback network? In what ways bipolar representation better than binary representation	
Q2	(20 marks)	**C02, CO3**
(a)	From a mathematical point of view, what is the process of learning in supervised learning? What is meant by epoch in the training process?	
(b)	What are the various types of fuzzy composition techniques?	
(c)	Implement OR function with binary inputs and bipolar targets using perceptron training algorithm?	
Q3	(20 marks)	**CO4, CO2, Co6**
(a)	Explain the applications of neural networks in image compression and control systems.	
(b)	Consider two fuzzy sets $A=\{\frac{1}{2.0}+\frac{0.65}{4.0}+\frac{0.5}{6.0}+\frac{0.35}{8.0}+\frac{0}{10.0}\}$ $B=A=\{\frac{0.2}{2.0}+\frac{0.55}{4.0}+\frac{0.7}{6.0}+\frac{0.65}{8.0}+\frac{1}{10.0}\}$ Find the following (1) AUB (2) A∩B (3) AU$\bar{A}$ (4) $\overline{AUB}$ (5) $\overline{A \cap B}$	
(c)	Implement XOR function using McCulloch-Pitts neuron (consider binary data)	
Q4	(20 marks)	**CO3**
(a)	Define defuzzification. Discuss in detail on the various types of defuzzification methods.	
(b)	Define fuzzy logic and crisp logic. With suitable examples, explain the operations and properties of fuzzy sets, crisp set, fuzzy relations, and crisp relations.	

(c)	Briefly explain the basic concepts of Genetic algorithms. Write short notes on 1. Fitness function 2. Mutation 3. Crossover	
Q5	(20 marks)	**CO5**
(a)	Using the genetic algorithm process, minimize the function $f(x)=x^2+5x$ Assume the necessary operators for the process of your own.	
(b)	List the various activation functions and learning rules used in neural network architectures.	
(c)	Implement OR function with bipolar inputs and targets using Adaline network?	

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TCS-826

B. TECH. (EIGHTH SEMESTER)

END SEMESTER EXAMINATION, June, 2024

UNIX SYSTEMS PROGRAMMING

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) What are orphan process and a zombie process in Unix ? Explain without writing any code. (CO6)

   (b) Illustrate the use of sem_wait() and sem_post() for critical section in Unix with the help of a small program. (CO2)

   (c) How is signal masking done in Unix and which signals cannot be masked ? (CO3)

2. (a) How does real-time process scheduling differ from normal scheduling ? What are the two real-time scheduling policies in Linux ? (CO6)

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(b) Using a diagram, Illustrate the use of shmget( ), shmat(), shmdt( ) system calls of shared memory IPC. (CO2)

(c) How does dup2() solve a problem with dup() call ? Explain. (CO1)

3. (a) Give real-world examples where buffered I/O should be used and another example where unbuffered I/O would be more suitable. (CO3)

(b) Write commands to disable and enable a CPU core. How does disabling/enabling a core affect multithreaded program ? (CO3)

(c) Describe the system calls pthread_create(), pthread_join() and pthread_exit(). What happens if main thread exits without calling pthread_exit(). (CO4)

4. (a) Write a small Unix program that changes the policy of a process with a given process Id to SCHED_FIFO and priority to 20. (CO4)

(b) Explain how client server programming is performed in Unix. You need to discuss the various functions that are used. (CO5)

(c) What are the various issues that you need to consider when designing concurrent servers ? Explain in detail. (CO5)

5. (a) Differentiate between SCHED_FIFO and SCHED_RR policies in Unix. What is SCHED_OTHER policy ? (CO4)

(b) Write a small Unix program that will print all files present in the current directory. NOTE : Do not use Is or any other Unix command. (CO3)

(c) A command given in Unix results in fork() followed by exec() calls. Explain. (CO1)

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Roll No. Paper Code: TCS 851

End Semester Examination 2024

Name of the Course: B.Tech *Semester*: 8TH C Paper Name: Storage Networks
Time: 3 Hours Maximum Marks: 100

Note:
(i) Answer **all the questions** by choosing ***any Two of the sub questions***.
(ii) Each question carries 10 marks.

(2X10=20 Marks)
CO1/CO2/CO3

Q1. a. A large company is considering a storage infrastructure- one that is scalable and provides high availability. More importantly, the company also needs performance for its mission-critical applications. Which storage topology would you recommend (SAN, NAS, IPSAN) and why?

b. i) What is HBA? Discuss the benefits of using multiple HBAs on a host.

ii) Why do formatted disks have less capacity than unformatted disks?

C. Explain briefly the layers of FC protocol stack.

(2X10=20 Marks)
CO2/CO3/CO4

Q2. a. Why isn't Fibre Channel used often for the internal drives inside system cabinets? List the four interconnects from slowest to fastest performance for storage networking applications.

b. What is symmetric storage virtualization? Write its advantages and disadvantages.

c. Explain storage virtualization at file level, with a necessary diagram.

(2X10=20 Marks)
CO3/CO4/CO5

Q3. a. What would you consider while choosing serial or parallel data transfer in a DAS implementation? Explain your answer and justify your choice.

b. Explain the process of data recovery in case of a drive failure in RAID 5.

c. Why is RAID 0 not an option for Data Protection and high Availability?

(2X10=20 Marks)
CO3/CO5/CO6

Q4. a. Write a short note on:

1. Hot Swap
2. Hot spare
3. RAID Controller

b. What is zoning? Discuss a scenario where hard zoning is preferred over soft

zoning.

c. What is FC-SAN? Discuss the advantage of FC-SW over FC-AL.

(2X10=20 Marks)
CO3/CO5/CO6

Q5. a. What is Network Attached Storage? Briefly describe the components of NAS. Write a note on Integrated NAS and Gateway NAS.

b. Explain IPSAN technologies. Describe some of the data storage applications that could benefit from IPSAN solution.

c. Explain the factors involved in measuring disk drive performance.

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TCS-852

B. TECH. (EIGHTH SEMESTER)

END SEMESTER EXAMINATION, June, 2024

PATTERN RECOGNITION

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Explain the concept of similarity measures in the context of data clustering. How do similarity measures influence the clustering results, and what are some common techniques to compute similarity between data points ? (CO1, CO2)

   (b) How are normal mixture models applied in the context of data clustering and density estimation ? Explain the underlying assumptions and advantages of using normal mixtures for modeling complex data distributions ? (CO1, CO2)

   (c) Discuss the applications of Continuous Hidden Markov Models (HMMs) in real- world scenarios such as gesture recognition, human activity recognition, and speech synthesis ? (CO1, CO2)

2. (a) How does facial recognition technology utilize pattern recognition principles to identify individuals, and what are the main challenges and limitations associated with its use in security systems ? (CO2, CO4, CO3)

P. T. O.

(b) Discuss the impact of choosing the number of clusters (K) on the effectiveness of K-means clustering. How can one determine the optimal number of clusters for a given dataset ? (CO2, CO4, CO3)

(c) How do low-dimensional representations benefit data visualization and interpretation, and what techniques are commonly used to achieve dimensionality reduction while preserving essential information ? (CO2, CO4, CO3)

3. (a) How are observation densities estimated, and what role do the Expectation Maximization (EM) algorithm and the Baum-Welch algorithm play in this training process ? (CO1, CO2)

(b) Describe the state decoding problem in Hidden Markov Models (HMMs) and discuss its relevance in real-world scenarios. (CO1, CO2)

(c) Discuss the application of pattern recognition in handwriting recognition systems. What techniques are commonly used, and how do these systems overcome the variability in individual handwriting styles ? (CO1, CO2)

4. (a) Describe the challenges associated with using the zero-one loss function in minimum error-rate classification. (CO2, CO5)

(b) How is Bayesian Decision Theory used to formulate classification problems, and what are the advantages and limitations of this approach compared to other classification methods ? (CO2, CO5)

(c) Discuss the fundamental concepts of discrete-time Markov processes and their relevance to Hidden Markov Models. (CO2, CO5)

5. (a) Explain the difference between the likelihood function and the log-likelihood function in the context of maximum likelihood estimation (MLE). (CO4, CO6)

(b) Explore the challenges associated with developing pattern recognition systems for real-world applications. What factors influence the system's effectiveness in handling complex data sets, and how can issues such as overfitting, dimensionality, and variability be addressed in system design ? (CO4, CO6)

(c) Outline the three basic problems associated with Hidden Markov Models (HMMs) and provide a brief description of each ? (CO4, CO6)

Roll No.....

Mid Semester Examination, June. 2024

Name of the Program: B. Tech. ***Semester:*** *VIII*

Name of the Course: Deep Neural Network based Custom Models and Training ***Course Code:*** TCS 836

Time: 1-1/2 Hour ***Maximum Marks***: 50

Note:

(i) Answer **all the questions** by choosing ***any one of the sub questions***.

(ii) Each question carries 10 marks.

Q1		10 Marks
(a)	Define neural network learning- backpropagation algorithm, parameters learning for a neural network.	CO1
	OR	
(b)	What is need of deep learning techniques in problem solving? Applications of deep learning, challenges of deep learning.	CO1
Q2		10 Marks
(a)	Three persons A, B and C have applied for a job in a private company. The chance of their selection ratio 1 : 2 : 4. The probabilities that A, B and C can introduce changes to improve the profits of the are 0.8, 0.5 and 0.3, respectively. If the change does not take place, find the probability that it is appointment of C.	CO2
	OR	
(b)	Suppose we want to group the visitors to a website using just their age (one dimensional space) as follows (n=19): 15,15,16,19,19,20,20,21,22,28,35,40,41,42,43,44,60,61,65. Apply K-means cluster algorithm to generation similar data cluster also justify number of iterations considered by you.	CO2
Q3		10 Marks
(a)	Evaluate association rules for the following transaction T with minimum support (minsup) =0.25 and minimum confidence (minconf) = 0.90:	CO2

t1:	Cricket, Kabaddi, Hockey
t2:	Cricket, Basketball
t3:	Basketball, Boots
t4:	Cricket, Kabaddi, Basketball
t5:	Cricket, Kabaddi, Clothes,

		Basketball, Hockey	
	Deduce all possible association rules for the above transaction.		
	OR		
(b)	Apply frequent pattern (f-p) growth algorithm used for association rules for the following transaction T with minimum support (minsup) =0.40 and minimum confidence (minconf) = 0.70: **Transaction** | **List of items** T1 | I1,I2,I3 T2 | I2,I3,I4 T3 | I4,I5 T4 | I1,I2,I4 Build FP tree for the above transaction.		CO2
Q4			10 Marks
(a)	What are challenges of deep learning algorithms? Explain with terms learning rate and momentum.		CO3
	OR		
(b)	What are different types of reinforcement learning algorithms? Differentiate policy and value iterations.		CO3
Q5			10 Marks
(a)	Evaluate Monte Carlo algorithm for policy iteration using value function and reward function. Write also its advantages over Q-learning.		CO3
	OR		
(b)	Evaluate Q-learning algorithm using value function and reward function. Write the effect of taking immediate reward apart from discounted reward.		CO3

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TCS-855

B. TECH. (CSE) (EIGHTH SEMESTER)
END SEMESTER EXAMINATION, June, 2024

AGILE SOFTWARE ENGINEERING

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Explain the need of scrum methodology in the project management system. (CO1)

   (b) A software engineer has found that the design and development process is going slower. The main reason behind this is lack of finding the bugs in the existing code. What is the best practice the developer should do in order to solve this ? Also explain Why ? (CO1)

   (c) What are key principles of lean software development ? Discuss it with suitable diagram. (CO1)

2. (a) Discuss about the burn down chart. How it is useful in the agile project ? (CO1, CO2)

   (b) A company named Raftsoft has been handling many large scale web projects for various clients. The problem with the company is managing the deadline. The client has an advantage of various experienced developers but have challenge of completing deadlines. Which is the

P. T. O.

Agile development practices do you think the company should practice ? (CO1, CO2)

(c) Scrum processes address the specific activities and flow of a Scrum project, compare initiation and plan estimation processes in Agile development. (CO1, CO2)

3. (a) COVID-19 : Impact on people, operations, and businesses : write a Scrum case study for the same. (CO2, CO3)

(b) List and explain the benefits of code refactoring. (CO2, CO3)

(c) Discussion about the Continuous Integration, Automated Build tools and version control. (CO2, CO3)

4. (a) UML is essential for design of the software. Explain categories of diagrams and symbols and also divide it into subcategories with suitable example.

(b) Discuss about the Substitutability in object oriented programing. What is strong behavioural subtyping in substitution principle ? (CO3, CO4, CO5)

(c) Discuss about the principle of Agile Testing Principles and explain any 5 useful open source testing tools for Agile testers. (CO3, CO4, CO5)

5. (a) Elaborate Agile test plan and exploratory testing is important activity in an agile environment, how it could help software tester in rapid development and why is it called Adhoc testing ? (CO5, CO6)

(b) What are the ways of enhancing agile software development using cloud computing and virtualization ? Explain it. (CO5, CO6)

(c) Discuss market scenario and adaptation of Agile with an example of an agile market research framework. (CO5, CO6)

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TOE–811

B. TECH. (CSE) (EIGHTH SEMESTER)
END SEMESTER EXAMINATION, June, 2024

MOBILE COMPUTING

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are twenty.

(iv) Each question carries 10 marks.

1. (a) Explain the characteristics of wireless channel with its transmission impediments. (CO1)

   (b) An octagon- shaped cell is closer to a circle than a hexagon. Explain why such a shape is not used an ideal shape of the cell. (CO1)

   (c) How does a cellular network function ? How does frequency reuse take place ? (CO1)

2. (a) What are two basic system architecture of IEEE 802.11 ? How it allows building of Adhoc networks ? (CO1, CO2)

   (b) List the problems faced when using TOP for the mobile networks.

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(CO1, CO2)

(c) What are important transmission mechanisms of signal propagation ? Discuss its advantages and disadvantages. (CO1, CO2)

3. (a) Explain HLR and VLR concept for location management in mobile communication. (CO1, CO2, CO3)

(b) What are challenges in data management and also describe data replication for mobile computer ? (CO1, CO2, CO3)

(c) What do you mean by multihopping ? Explain multi cluster architecture and problems related to this architecture. (CO1, CO2, CO3)

4. (a) Discuss design goals and architecture of CODA file system. Discuss about side effect in CODA file system. (CO3, CO4)

(b) What are the requirements of mobile agents ? Discuss life cycle of mobile agent-based computing with suitable diagram. (CO3, CO4)

(c) What is security & fault tolerance issues, describe briefly. (CO3, CO4)

5. (a) Discuss Characteristics of Mobile Adhoc Networks ? Why is it not possible to use circuit switching in Adhoc networks ? (CO5, CO6)

(b) Discuss responsibilities and design issues of MAC protocol. (CO5, CO6)

(c) Explain some disadvantage DSDV and AODV routing protocol. Discuss about the scenario where these protocols are suitable. (CO5, CO6)

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TOE–803

B. TECH. (CSE) (EIGHTH SEMESTER)
END SEMESTER EXAMINATION, June, 2024

CORPORATE LEADERSHIP

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are twenty.

(iv) Each question carries 10 marks.

1. (a) Explain the role of motivation in the workplace and discuss different theories of motivation. (CO2)

   (b) How do leadership traits and skills contribute to fostering a positive organizational culture ? (CO3)

   (c) How do leaders ensure that their actions align with the pillars of integrity and transparency in their leadership architecture ? (CO1)

2. (a) How does a manager navigate change and uncertainty within their organization while maintaining their leadership effectiveness ? (CO1)

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(b) What are the current trends and best practices in corporate leadership development, and how should companies adapt to them ? (CO2)

(c) Compare and contrast transformational leadership theories. How do they impact organizational outcomes differently ? (CO4)

3. (a) What do you consider to be the most effective leadership style in a crisis situation ? (CO2)

(b) Outline the key components of a strategic roadmap for effective leadership development. (CO3)

(c) What are the key components of emotional intelligence that leaders should cultivate ? (CO2)

4. (a) What were some key strategies implemented by Azim Premji to navigate Wipro through challenging economic and industry landscapes ? (CO1)

(b) What are some key characteristics of Lakshmi Mittal's leadership style, and how have they contributed to his success ? (CO5)

(c) What are the key strategies implemented by Fiipkafts leadership to maintain its competitive edge in the e-commerce market ? (CO3)

5. (a) How does Mark Zuckerberg's vision for Facebook align with his leadership approach ? (CO6)

(b) What are some key characteristics of Bill Gates' leadership style, and how have they contributed to his success ? (CO2)

(c) Can you discuss the impact of Jack Ma's philosophy on Alibaba's success ? (CO3)

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TOE–806

B. TECH. (CSE/CE & CE-SPL/CST, CST-SPL1 & CST-SPL2/ AI&DS) (EIGHTH SEMESTER) END SEMESTER EXAMINATION, June, 2024

MOBILE AD-HOC NETWORK

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each question carries 10 marks.

1. (a) Explain the role of MAC protocols in Mobile Ad-Hoc Networks (MANETs). What are the main classifications of MAC protocols ? (CO2)

   (b) Talk about the power control and multi-channel MAC protocols. How do these address the challenges associated with MANETs ? (CO4)

   (c) Which are the main concerns regarding Mobile Ad-Hoc Networks (MANETs) security ? In what ways can MAC protocols allay these security worries ? (CO1)

2. (a) Describe the various routing protocol classifications that are applied in ad hoc networks. Describe power-aware and hierarchical routing. (CO5)

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(b) Explain split TCP and ad hoc TCP. How do these modifications enhance Ad-Hoc Network performance ? (CO2)

(c) Distinguish between Ad-Hoc Networks' tree-based and mesh-based multicast routing protocols. (CO4)

3. (a) Determine the differences between CSMA-based MAC protocols and hybrid TDMA/FDMA protocols in WSNs. (CO5)

(b) Apply the significance of MAC protocols to Wireless Sensor Networks (WSNs). Discuss on MAC approaches that self-organize. (CO3)

(c) What is a Wireless Sensor Network (WSN) ? Describe the architecture of a typical sensor network. (CO1)

4. (a) What difficulties does localization in WSNs present ? Describe the methods used for sensor network and indoor localization. (CO1)

(b) Analyze the concept of Quality of Service (QoS) in Wireless Sensor Networks (WSNs). How is QoS achieved in data transmission within WSNs ? (CO4)

(c) Categorize -and talk about the problems are unique to wireless sensor networks (WSN5). Describe the functions of AODV and OLSR in WSN routing. (CO3)

5. (a) Explain Mesh Networks necessary in modern communication systems ? Discuss the erthancements required in MAC protocols for Mesh Networks. (CO5)

(b) Discuss the importance of self-configuration and auto-configuration in Mesh Networks. How do these feature benefit network deployment ? (CO6)

(c) Discuss the Heterogeneous Mesh Networks and Vehicular Mesh Networks ? Describe the challenges and solutions associated with these types of networks. (CO6)

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UCE–801

B. TECH. (EIGHTH SEMESTER)

END SEMESTER EXAMINATION, June, 2024

DISASTER MANAGEMENT

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are twenty.

(iv) Each question carries 10 marks.

1. (a) "Disaster and Development are closely linked." Explain this statement with help of an example. (CO1/CO2)

   (b) What are the consequences of disaster on health services/facilities ? (CO1/CO2)

   (c) What is the importance of Disaster Management ? (CO1/CO2)

2. (a) Write down the classifications / types of hazards and mention some examples related to each category. (CO2)

   (b) What is Landslide ? Discuss about its cause, measure to be adopted and Do's and Don'ts during a Landslide ? (CO2)

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(c) Discuss about Cyclone. What are the major causes for avalanche ? Discuss about different types of Avalanches ? (CO2)

3. (a) Discuss about Biological Disaster in brief. What are the methods of dissemination or delivery for biological agents ? (CO2/CO3)

(b) What is a Tsunami ? How do landslides, volcanic eruptions, and cosmic collisions generate tsunamis ? (CO2/CO3)

(c) What is Man-Made Disaster ? How they are different from Natural Disaster ? (CO2/CO3)

4. (a) Discuss about Radiation and Radioactive Substances. What is the effect of Radiation on Humans ? (CO5)

(b) What is the difference between Seismic Zoning and Seismic Microzonation ? (CO5)

(c) Mention some Do's and Don'ts when someone is stucked in a cyclone. (CO5)

5. (a) What is meant by Seismic microzonation and its need ? (CO4/CO5)

(b) Explain briefly the economic, environmental, and social impact of Droughts. (CO4/CO5)

(c) Explain the term "Biological Disaster". Quote an example to explain it and write down its effect on human population ? (CO4/CO5)

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TEC-801

B. TECH. (EIGHTH SEMESTER)
END SEMESTER EXAMINATION, June, 2024

COMPUTER ARCHITECTURE

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Explain with a neat diagram the connection between the processor and memory. Determine the size of memory chip if it has 20 address lines and 8 data lines. (CO1)

   (b) Explain BIG-ENDIAN and LITTLE-ENDIAN methods of byte addressing with proper examples. (CO1)

   (c) Perform the following operations on the 5-bit signed numbers using 2's complement representation system. Also indicate whether overflow has occurred. (CO1)

   (i) $(-9) + (-7)$

   (ii) $(+7) - (-8)$

2. (a) Perform multiplication for $(-13)_{10}$ and $(+9)_{10}$ using Booth's algorithm. Show all the steps of algorithm. (CO2, CO3)

   (b) Explain the 32-bit floating point numbers multiplication algorithm. (CO2, CO3)

   (c) Draw and explain the flowchart of restoring division with an example. (CO2, CO3)

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3. (a) Draw and explain single bus processor organization. Give the micro-operation control sequence for executing ADD RI, (R2). (CO2, CO3)
   (b) With the help of suitable diagram, explain the working of hardwired control unit. List its advantages and disadvantages. (CO2, CO3)
   (c) Illustrate the functioning of a micro-programmed control unit using an appropriate diagram. Enumerate its benefits and drawbacks.(CO2, CO3)
4. (a) With reference to memory system, define the following terms : (CO4)
      (i) Memory Access Time
      (ii) Memory Cycle Time
      (iii) Cache Memory
      (iv) Virtual Memory
      (v) Static Memory
   (b) What are hit-and-miss cache conditions ? fn a computer application program, 1400 times the memory is accessed. 150 times data was accessed from primary memory. Determine cache memory hit rate. (CO2, CO3)
   (c) Differentiate between the various cache mapping techniques. (CO2, CO3)
5. (a) Discuss the various bus standards used in a typical computer system. (CO5, CO6)
   (b) List of the differences between the following : (CO5, CO6)
      (i) Memory mapped 110 and 110 mapped 110
      (ii) Programmed 110 and Interrupt driven I/O
   (c) Explain with suitable diagrams the working of DMA controller. (CO5, CO6)