

(2 ½ Hours)

[Total marks: 60]

- N. B.: (1) **All questions are compulsory**  
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 (3) **Assume additional data if necessary** but state the same clearly.  
 (4) **Symbols have their usual meanings** unless stated otherwise.

- Q.1** Attempt **any two** of the following (12)
- List and highlight the five internal properties of Ubiquitous Systems. 6
  - Write a note on transparency and openness in modern Ubiquitous systems. 6
  - Explain what do you mean by implicit HCI? 6
  - Explain the ICT device and Physical World Interaction (CPI) in working with Ubiquitous systems. 6
- Q.2** Attempt **any two** of the following (12)
- What is meant by mobile code? What are its benefits and challenges? 6
  - Write a note on user interface designs for personal computer interface. 6
  - Briefly describe the Single and Multi-Modal Visual Interfaces. 6
  - What are wearable computers? What are its benefits? Give examples. 6
- Q.3** Attempt **any two** of the following (12)
- What is Tagging? What are the issues in tagging in smart physical environment? 6
  - What are the RFID Tags? Explain its components. 6
  - Briefly explain the concept behind Sensors and Sensor Networks used in modern Ubiquitous systems. 6
  - Explain how Micro Actuation and Sensing is useful in implementing and using Ubiquitous computing. 6
- Q.4** Attempt **any two** of the following (12)
- Explain how audio network helps in realizing pervasive communications. What are its types? 6
  - What are data network? List and explain different types of data network. 6
  - List and explain various design issues in Ubiquitous network communication. 6
  - Write a note on video data network. What are its challenges? 6

- Q.5** Attempt **any two** of the following **(12)**
- a) What is smart DEI? Explain how can we reduce reducing complexity these systems? **6**
  - b) Explain the salient features of Human Centred Design. **6**
  - c) Compare between hard and soft RTS. **6**
  - d) Write a note on control systems in smart environment. **6**

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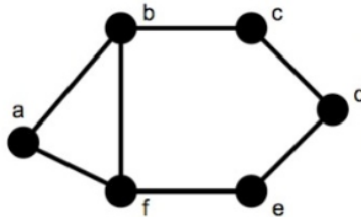
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Q.1 Attempt **any two** of the following (12)

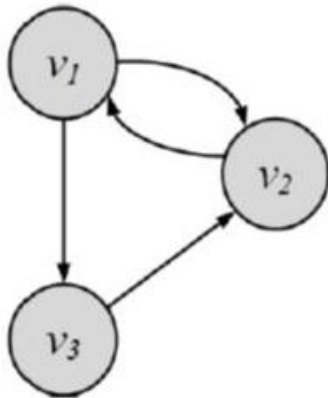
- a) What is DFS? Explain its use in social network analysis. 6  
 b) Design & Analyze What are Informal Networks and Why Should I Care? 6  
 c) What do you mean by page rank? Explain page rank algorithm with an example. 6  
 d) Compare adjacency matrix and adjacency list to represent relations among actors in social network? Explain 6

Q.2 Attempt **any two** of the following (12)

- a) Compute the following graph theoretic concepts : 6  
 i) Density ii) Connectedness iii) Degree of centrality

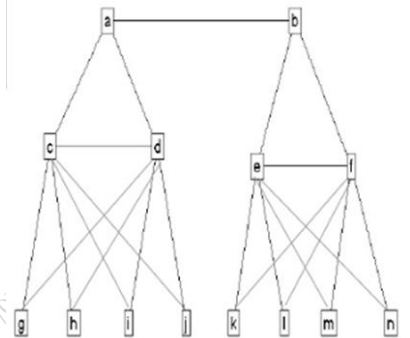


- b) Define Reciprocity. Find the reciprocity for the given diagram 6



- c) What are cliques? Explain following terms with respect to cliques: 6  
 i) N-cliques ii) N-clans iii) K-plexes  
 d) Construct a centrality scenario & evaluate the significance of centrality in social network analysis. 6

- Q.3 Attempt **any two** of the following (12)
- a) Illustrate how an adjacency matrix will be more beneficial than network diagram in assessing similarity or dissimilarity. 6
  - b) Explain different equivalence classes with example. 6
  - c) Explain any one of the clustering tools used in social network analysis. 6
  - d) What is Blockmodeling? Explain with an example. 6
- Q.4 Attempt **any two** of the following (12)
- a) Explain the use of two-mode network in social network analysis. 6
  - b) Develop the method of identifying the factors underlying two-mode (valued) data. 6
  - c) Explain two mode SVD analyses with example. 6
  - d) Difference between Quantitative analysis & Qualitative analysis. 6
- Q.5 Attempt **any two** of the following (12)
- a) Explain The Seven Bridges of Konigsberg with proper diagram 6
  - b) Write a short note on following: 6
    - i) Lambda sets and bridges
    - ii) Blocks and cut-point
  - c) Explain different methods of measuring distances in social network analyses. 6
  - d) Develop the given diagram into a Block modeling Matrix. 6



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- Q.1** Attempt any two of the following (12)
- What is service-oriented computing? How it is useful in Cloud computing? 6
  - Explain two reference models for achieving the communication among processes in Cloud computing. 6
  - Explain reference architecture of Cloud computing Distributed system. 6
  - What are hypervisors? Why they are used in Cloud computing? 6
- Q.2** Attempt any two of the following (12)
- Describe SaaS, PaaS and IaaS Cloud computing services with example. 6
  - Describe Web services and mashup architectures for integration over the internet. 6
  - What are enterprise components used in Cloud computing? Explain the component view of enterprise architecture. 6
  - Define Cloud computing and give its characteristics. 6
- Q.3** Attempt any two of the following (12)
- How AJAX applications work? Why they are called 'rich internet applications'? 6
  - When to use SOAP/WSDL Web service or REST Web service in Cloud based applications? 6
  - Explain virtualization as a mechanism to achieve multi-tenancy at the system level. 6
  - What are multi-core processors? Why they are used in Cloud Computing? 6
- Q.4** Attempt any two of the following (12)
- Explain any one enterprise software? How Cloud computing technologies are used in implementing this enterprise software? 6
  - What is Dev 2.0 paradigm? What are its advantages in Cloud computing? 6
  - How the layered architecture is implemented in practice? Give an example. 6
  - What tasks a business logic method needs to handle? State various design strategies and architecture frameworks used for implementing business logic. 6

- Q.5** Attempt **any two** of the following **(12)**
- a) State and explain characteristics of MapReduce programming model. **6**
  - b) Differentiate between computation and communication with context to Cloud computing. **6**
  - c) What is data-intensive computing? **6**
  - d) Comment on ‘Public cloud services can be cheaper than using similar virtualized infrastructure in-house’. **6**

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**Q.1 Attempt any two of the following (12)**

- Define the term Computer Forensics. State and explain the various Computer Forensics services.
- Write a short note on Network Disaster Recovery Systems.
- Discuss the problems of Computer Forensics Evidence.
- State and explain the components of Identity Management Environment.

**Q.2 Attempt any two of the following (12)**

- What are the different categories of Evidence?
- Explain the steps to collect evidence.
- State and explain the various obstacles for backing up applications.
- Discuss the rules of evidence.

**Q.3 Attempt any two of the following (12)**

- What evidence can be collected from NIDS/NIPS? Discuss.
- State and explain the common attacks on Wireless Networks.
- Discuss the Forensic value of the following network based evidence:
  - Routers
  - DHCP Servers
  - Application Servers
- What are the various ways through which investigators gain access to live network-based devices?

Q.4 **Attempt any two of the following** (12)

- a) State and explain the various types of log architectures.
- b) What type of evidence can be collected from web proxies?
- c) Discuss the various evidence that can be collected from a mobile phone.
- d) What are the various files stored on a SIM? Discuss.

Q.5 Being a computer forensic specialist, you have been assigned a task to analyze the digital evidence at a crime scene. Based on it **Attempt any two of the following** (12)

- a) Prepare a list of evidence sources in their order of volatility.
  - b) What procedure will you follow to gather the evidence?
  - c) What strategies will you use to locate wireless devices?
  - d) Discuss the OSCAR methodology for forensic in this case.
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- Q.1 Attempt **any two** of the following (12)
- a) Define Big data. State and explain the traits of Big data. 6
  - b) Write a short note on sampling and Re-sampling in Big data. 6
  - c) What is Regression? Explain in detail the Linear Regression model. 6
  - d) What is Fuzzy Logic? Explain in detail the Fuzzy Decision Tree. 6
- Q.2 Attempt **any two** of the following (12)
- a) What is Map-Reduce? Give the overview of the execution of a Map Reduce program with suitable diagram. 6
  - b) Explain how matrix-vector multiplication can be performed by MapReduce, When vector  $v$  cannot fit in main memory. 6
  - c) Explain how MapReduce is implemented for computing Union, Intersection and Difference. 6
  - d) Explain the concept of Recursive Extensions to MapReduce with suitable diagram. 6
- Q.3 Attempt **any two** of the following (12)
- a) Explain the concept of Collaborative Filtering with suitable examples. 6
  - b) Compute the Jaccard bag similarity of each pair of the following two bags: 6
    - i)  $A = \{1,2,3,4,5,7,9\}$   $B = \{1,3,5,7,10\}$
    - ii)  $A = \{\text{Red,Green,Blue,Pink,White}\}$   $B = \{\text{Red,Green,White,Indigo}\}$
  - c) Define K-shingle. How to define the Shingle size? 6
  - d) Explain the concept of Locality Sensitive Hashing(LSH) for documents. 6
- Q.4 Attempt **any two** of the following (12)
- a) Discuss in detail the Stream Data Model. 6
  - b) Explain how Bloom filters works for streaming Data. 6
  - c) Describe in brief the Alon-Matias-Szegedy Algorithm works for second moment with example. 6
  - d) Discuss Datar-Gionis-Indyk-Motwani Algorithm. 6

- Q.5 Attempt **any two** of the following (12)
- a) State and explain in brief three essential techniques for finding of similar documents. **6**
  - b) Write a short note on real time analytics platform. **6**
  - c) Using the data matrix given below compute the minhash signature for each column with the help of given two hash functions:  
 $h1(x)=x+1 \text{ mod } 5$  ,  $h2(x)=3x+1 \text{ mod } 5$  **6**

<i>Element</i>	<i>S1</i>	<i>S2</i>	<i>S3</i>	<i>S4</i>
<i>b</i>	0	0	1	0
<i>e</i>	0	0	1	0
<i>a</i>	1	0	0	1
<i>d</i>	1	0	1	1
<i>c</i>	0	1	0	1

- d) Explain the concept of Decaying Windows in finding the most common recent element. **6**

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**Q.1** Attempt **any two** of the following (12)

- a) Define discrete random variable and explain Bayes rule. 6
- b) Explain any two continuous distributions. 6
- c) Write a short note on EM algorithm. 6
- d) Define entropy and explain Naïve bayes classifier. 6

**Q.2** Attempt **any two** of the following (12)

- a) Explain RBF and String kernels with an example. 6
- b) Write a short note on SVM. 6
- c) Explain Markov random fields with an example. 6
- d) What are the applications of Conditional random fields? 6

**Q.3** Attempt **any two** of the following (12)

- a) Explain the idea of Particle filtering algorithm. 6
- b) Write a short note on rejection sampling. 6
- c) Explain Speed and accuracy of Markov chain Monte Carlo (MCMC) inference. 6
- d) Write a short note on Simulated annealing. 6

**Q.4** Attempt **any two** of the following (12)

- a) Write a short note on Learning tree structures. 6
- b) Explain with an example Deep neural networks. 6
- c) What are the applications of deep networks? 6
- d) Write a short note on Deep auto-encoders. 6

**Q.5** Attempt **any two** of the following (12)

- a) Write a short note on Monte Carlo approximation. 6
- b) Write a short note on HMM. 6
- c) Explain Gibbs sampling in details. 6
- d) Explain the concept of Semantic Hashing. 6