(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt ANY FOUR from the following: (20M)
(a) What is Cyber law? Explain the component of Cyber Law in India.
(b) What was the need for the Enactment of the Information Technology Act 2000? Discuss.
(c) What is E-Commerce? Explain its various models.
(d) Differentiate between Electronic Signature and Digital signature.
(e) What is E-Governance? Explain provisions of Information Technology Act 2000 related to E-Governance.
(f) Who can become the Certifying Authority under the Information Technology Act 2000? Explain his role.

Q. 2 Attempt ANY FOUR from the following: (20M)
(a) Briefly explain salient features of the Data Protection Bill, 2021 of India.
(b) Discuss Cyber contraventions under IT ACT 2000?
(c) Can an intermediary be held liable for cyber offences? Explain the law.
(d) Explain the power of investigation, search and arrest mentioned under the IT ACT 2000.
(e) Explain grey areas of the IT Act 2000 as amended by the IT (Amendment) Act 2008.
(f) What is computer forensics? Explain different stages of Forensic investigation.

Q. 3 Attempt ANY FOUR from the following: (20M)
(a) Briefly explain international law regarding online freedom of speech and expression.
(b) Give the Significance of Universal Copyright Convention, 1952.
(c) Write about how Patents and Copyright are different from each other.
(d) Give a comprehensive explanation of "Intellectual property".
(e) What is Spamming and Phishing? Explain the Anti-Spamming and Anti-Phishing initiatives?
(f) Explain the significance of Copyright work in the Digital medium and its infringement.

Q. 4 Attempt ANY FIVE from the following: (15M)
(a) Explain the parties to the E-Contract.
(b) Elucidate Cyber Terrorism.
(c) "Copyright and Reverse Engineering in computer software: An Indian Perspective". Comment

(d) Write a short note on Pegasus Spyware.

(e) What is e-consumer? Whether e-consumer in Indian law is protected? Describe.

(f) Explain the meaning of Trademark.

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(2 ½ Hours)   [Total Marks: 75]

N.B.   1) All questions are compulsory.
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        3) Illustrations, in-depth answers and diagrams will be appreciated.
        4) Mixing of sub-questions is not allowed.

Q. 1   Attempt ANY FOUR from the following: (20M)
(a)   Explain the structure of SOAP message.
(b)   Write a web service method that accepts two numbers as parameters and returns the largest of those numbers using JAX-WS. (Write only the Webservice method block)
(c)   Differentiate between Parallel Computing and Distributed Computing.
(d)   List and explain the various Http methods required for creating RESTful Web Services.
(e)   Explain the different characteristics of Virtualized environment.
(f)   Explain virtualization using KVM.

Q. 2   Attempt ANY FOUR from the following: (20M)
(a)   Explain the advantages of Cloud Computing.
(b)   Describe the Cloud Computing Reference Model in detail
(c)   Explain open challenges of Cloud Computing.
(d)   Write about various Security Services of Cloud.
(e)   Explain the cloud security design principles.
(f)   Explain Cloud Security Policy Implementation.

Q. 3   Attempt ANY FOUR from the following: (20M)
(a)   Explain CloudSim architecture in detail. Also draw the necessary diagram for the same.
(b)   Explain different features of CloudSim.
(c)   Write about the working platform for CloudSim.
(d)   Explain the key components of OpenStack?
(e)   What is DevStack? Explain the installation steps.
(f)   Explain Components and services of AWS.

Q. 4   Attempt ANY FIVE from the following: (15M)
(a)   Write in short about JAX-WS.
(b)   What are the type of Cloud? Write in short about any one
(c)   Write a short note on GridSim.
(d)   Describe oVirt in short.
(e)   What are the security best practices for AWS.
(f)   What is an OpenStack.

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(2 ½ Hours)　　　　　　　　[Total Marks: 75]

N.B.　1) All questions are compulsory.
　　　2) Figures to the right indicate marks.
　　　3) Illustrations, in-depth answers and diagrams will be appreciated.
　　　4) Mixing of sub-questions is not allowed.

Q. 1　Attempt ANY FOUR from the following:　　　　　　(20M)
(a)　Define Data Science. Discuss in detail applications of Data Science.
(b)　Explain Data Warehousing (DW) and Data Mining (DM) in detail.
(c)　Explain in detail different Data Sources.
(d)　Describe in detail Data Transformation.
(e)　Define Data Wrangling. Discuss Data Wrangling Techniques.
(f)　Discuss about Feature Engineering and Time Series Data.

Q. 2　Attempt ANY FOUR from the following:　　　　　　(20M)
(a)　Explain Data Visualization techniques in detail.
(b)　Define Descriptive Statistics. Explain Mean, Median, Mode and Standard Deviation in detail.
(c)　Explain in detail Classification and Regression analysis.
(d)　Define bias, variance and discuss about bias-variance tradeoff.
(e)　Discuss different techniques for evaluating model performance.
(f)　Explain Ensemble Learning with Bagging and Boosting.

Q. 3　Attempt ANY FOUR from the following:　　　　　　(20M)
(a)　Explain storytelling in analysis in detail.
(b)　Discuss visualization tools in detail
(c)　List and Discuss Data Management Activities.
(d)　Elaborate the concept of Data Governance.
(e)　Illustrate Extraction, Transformation and Load (ETL) in detail.
(f)　Give the importance of Data Quality.

Q. 4　Attempt ANY FIVE from the following:　　　　　　(15M)
(a)　Differentiate between structured and unstructured data.
(b)　Explain Hyperparameter Tuning.
(c)　Define Accuracy and Explain in brief.
(d)　Discuss any three libraries of Data Science.
(e)　Differentiate between underfitting and overfitting.
(f)　Define Precision, Recall and F1-Score.

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(2 ½ Hours)   [Total Marks: 75]

N.B.   1) All questions are compulsory.
         2) Figures to the right indicate marks.
         3) Illustrations, in-depth answers and diagrams will be appreciated.
         4) Mixing of sub-questions is not allowed.

Q. 1   Attempt ANY FOUR from the following: (20M)
(a)   Explain the Types of Ethical Hacking
(b)   Explain Hacking Technology and its types in detail
(c)   Define Hacktivism and explain ways to manifest it
(d)   Explain any 5 Hacker Classes
(e)   What are the ways to conduct Ethical Hacking
(f)   Write a short note on foot printing

Q. 2   Attempt ANY FOUR from the following: (20M)
(a)   Ex[plain Active and Passive Sniffing
(b)   Explain ARP Poisoning in Detail
(c)   Explain DNS Spoofing Techniques in detail
(d)   Explain the working of DOS attack in detail
(e)   Explain Smurf attack in detail
(f)   Explain types of Session Hijacking

Q. 3   Attempt ANY FOUR from the following: (20M)
(a)   Explain methods involved in Google Hacking
(b)   Define the term Authentication and its types
(c)   Define SQL injection and names its types
(d)   Explain Buffer –Overflow and its types.
(e)   Explain WEP in detail
(f)   Explain the working of wireless sniffing

Q. 4   Attempt ANY FIVE from the following: (15M)
(a)   Explain the methods to perform information Gathering
(b)   Define Password and its types
(c)   Explain Mutation Techniques
(d)   Define the terms (i)Scanning   (ii)Enumeration
(e)   What is Web Server Hardening?
(f)   Write a short note on Rogue Access Point

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(2½ Hours)

[Total Marks: 75]

N.B.   1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

1.   Attempt *any four* of the following: 20
a.   What is information retrieval example? What are the characteristics of information retrieval.
b.   What are the components and What are the major challenges faced in Information Retrieval.
c.   What is edit distance, and how is it used in measuring string similarity with suitable example.
d.   Explain the process of constructing an inverted index. How does it facilitate efficient information retrieval?
e.   What is relevance feedback in the context of retrieval models.
f.   Explain Vector space model. Discuss TF-IDF, cosine similarity.

2.   Attempt *any four* of the following :   20
a.   Define text categorization and explain its importance in information retrieval systems.
b.   How can clustering be utilized for query expansion and result grouping in information retrieval systems.
c.   Explain the effectiveness of K-means and hierarchical clustering in text data analysis.
d.   Explain the architecture of a web search engine. What are the components involved in crawling and indexing web pages.
e.   What is the role of supervised learning techniques in learning to rank and their impact on search engine result quality.
f.   Discuss the difference between the PageRank and HITS algorithms.

3.   Attempt *any four* of the following :   20
a.   Explain breadth-first and depth-first Web page crawling Techniques?
b.   Define near-duplicate page detection and its significance in web search. Explain the challenges associated with identifying near-duplicate pages.
c.   Describe common techniques used in extractive text summarization.
d.   What are Challenges associated with question answering.
e.   Define collaborative filtering and content-based filtering in recommender systems.
f.   Explain different approaches to machine translation, including rule-based, statistical, and neural machine translation models.

4. **Attempt _any five_ of the following :**   15

a   Discuss the steps involved in the Soundex Algorithm for phonetic matching.

b   Construct 2-gram, 3-gram and 4-gram index for the following terms:
    a. banana
    b. pineapple
    c. computer

c   Discuss the Naive Bayes algorithm for text classification. How does it work, and what are its assumptions.

d   Discuss how link analysis can be used in social network analysis and recommendation systems.

e   Discuss challenges in abstractive text summarization.

f   Describe the role of test collections and benchmarking datasets in evaluating IR systems.

(2 ½ Hours)   [Total Marks: 75]

N.B.   1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1   Attempt ANY FOUR from the following: (20M)
(a)   State the applications of Wireless Sensor Networks.
(b)   In Wireless Sensor Networks, state the three types of Mobility.
(c)   Why gateways are needed in WSN?
(d)   Explain aggregation in-network processing.
(e)   Give the optimization goals of Wireless Sensor Network.
(f)   What is a MANET? Give its characteristics.

Q. 2   Attempt ANY FOUR from the following: (20M)
(a)   Explain SPIN.
(b)   Write short note on Self-Organizing Medium Access Control for Sensornets
(c)   Give the challenges in designing of middleware for WSNs.
(d)   Write short note on:
      i.   Flooding
      ii.   Gossiping
(e)   What is Low Energy Adaptive Clustering Hierarchy(LEACH)? State its advantages and disadvantages.
(f)   Explain Middleware Architecture.

Q. 3   Attempt ANY FOUR from the following: (20M)
(a)   Give different effects of Signal Propagation.
(b)   Write short note on GEO.
(c)   Explain Mobile services of GSM.
(d)   Give the steps for Mobile Terminated Call (MTC).
(e)   State and explain application of Satellite.
(f)   Explain the Routing mechanism of Satellite.

Q. 4   Attempt ANY FIVE from the following: (15M)
(a)   List and explain components of basic sensor node.
(b)   Explain Periodic and sleep operations of S-MAC
(c)   Define Spread Spectrum.
(d)   Write short note on
      i.   Publish/Subscribe
      ii.   Database
(e)   Discuss the advantages of Multi-Hop approach.
(f)   Write short note on LEO.

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