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14SCS/SCE21

Second Semester M.Tech. Degree Examination, June/July 2016
Managing Big Data

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. Discuss the variety dimension of Big Data. What is structured, unstructured and semi-structured data? Explain with examples. (10 Marks)
- b. How big data analytics can help in detecting fraud? Explain with industry example. (10 Marks)
- 2 a. Explain the three business models for big data. (06 Marks)
- b. What is impedance mismatch? Why is it a major source of frustration for application developers? (06 Marks)
- c. What are different ways of constructing version stamps? What are their pros and cons? (08 Marks)
- 3 a. Compare and contrast sharding and replication. Explain the advantages and limitations of sharding and replication. (10 Marks)
- b. Explain the trade off involved in consistency and availability with respect to the CAP theorem. (10 Marks)
- 4 a. Write brief note on materialized views. (04 Marks)
- b. A Hadoop cluster is configured to use block size of 128 MB and replication factor of 3. A user has a file "mylife" of size 520 MB and uses the following command:
"hadoop fs-put myfile /user/hadoop".
i) What is the size of the last block of the file when stored on HDFS?
ii) How many blocks will be stored on HDFS for the file? (04 Marks)
- c. Discuss the factors considered for design of HDFS. Which are the areas where HDFS is not a good fit today? (12 Marks)
- 5 a. What is the mechanism used by HDFS to ensure data integrity? How data nodes and clients verify the data for integrity? (06 Marks)
- b. What is serialization and why is it needed? Explain the process of serialization and de-serialization in Hadoop. (08 Marks)
- c. Explain the following in brief,
i) Hadoop streaming ii) Reduce function. (06 Marks)
- 6 a. Explain mapreduce workflows. (10 Marks)
- b. Given a text file containing multiple words, we need to count how many times each word appears in the file using mapreduce. Explain shuffle and sort in detail for this word count problem using a neat diagram. (10 Marks)
- 7 a. Explain with a neat diagram, how hadoop runs a map reduce job using YARN. (10 Marks)
- b. Provide overview of HBASE data model. (10 Marks)
- 8 Write a brief notes on:
a. PIG data model, i.e., data types.
b. Hive QL.
c. CASSANDRA
d. AVRO. (20 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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14SCS22

Second Semester M.Tech. Degree Examination, June/July 2016
Advances in Computer Network

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

1. a. Explain the requirements to built a computer networks that will support different applications. (10 Marks)
 b. Briefly discuss the different performance metrics of networks. Calculate the delay \times bandwidth product for channel with one way latency of $10\mu s$ and bandwidth of 100 Mbps. (10 Marks)
2. a. With illustration explain the sliding window algorithm. (10 Marks)
 b. Explain TCP/IP layer reference model. Discuss two protocol layering principles. (10 Marks)
3. a. What is source routing? With an example explain three ways to handle header for source routing. (10 Marks)
 b. Describe the spanning tree algorithm. For extended LAN shown in Fig. Q3(b), assume that bridge B_1 suffers catastrophic failure. Indicate which ports are not selected by the spanning tree algorithm after the recovery process and a new tree has been formed. (10 Marks)

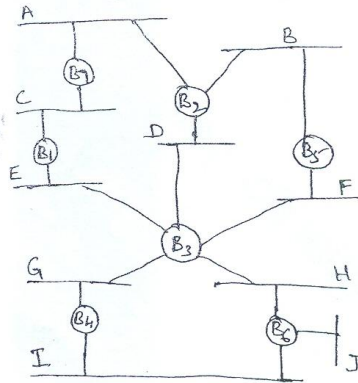


Fig. Q3(b)

4. a. Explain link state routing algorithm and trace the algorithm for the network shown in Fig. Q4(a). (10 Marks)

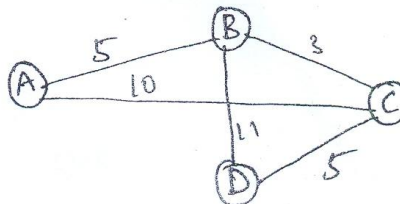


Fig. Q4(a)

- b. With an example explain the need of subnetting. (10 Marks)

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- 5 a. List the BGP characteristics and give the BGP path attributes. (10 Marks)
b. Explain the following :
i) Mobile IPV4 address
ii) IPV4 registration message format. (10 Marks)
- 6 a. Describe the format of UDP header and UDP message queue. (08 Marks)
b. Explain different end-to-end issues in the TCP protocol. (06 Marks)
c. Write a short note on reliable and order delivery. (06 Marks)
- 7 a. Explain the principle of bit-by-bit algorithm under round robin scheme in fair queuing for congestion control. (10 Marks)
b. Explain the implementation of RED algorithm. (10 Marks)
- 8 a. Explain the following :
i) Mapping domain names to address (10 Marks)
ii) Mail retrieval and mail bot manipulation protocol. (10 Marks)
b. With neat diagram, explain structure and representing MIB object names. (10 Marks)

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14SCS23

Second Semester M.Tech. Degree Examination, June/July 2016
Advanced Algorithms

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

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1.
 - a. Define and explain the various asymptotic notations with related graphs and examples. (08 Marks)
 - b. Solve the following recurrence relation to give a tight upper bound using substitution method.

$$T(n) = 4T\left(\frac{n}{2}\right) + n^2$$
 (06 Marks)
 - c. Illustrate the aggregate analysis of amortized analysis on the operation INCREMENT in a binary counter. (06 Marks)
2.
 - a. Use a recursion tree to determine a good asymptotic upper bound on the recurrence

$$T(n) = 2T\left(\frac{n}{2}\right) + n.$$
 (09 Marks)
 - b. State the Master theorem and solve the following recurrence relations using Master theorem.
 - i) $T(n) = 9T\left(\frac{n}{3}\right) + n$
 - ii) $T(n) = T\left(\frac{2n}{3}\right) + 1$ (06 Marks)
 - c. Write the Johnson's algorithm to solve all-pairs shortest path problem for sparse graphs. (05 Marks)
3.
 - a. Using Bellman-Ford algorithm, find the shortest path from the source vertex 'S' to the remaining vertices in the graph shown in the Fig. Q3 (a). (10 Marks)

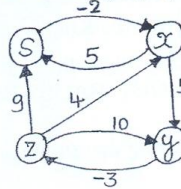


Fig. Q3 (a)

- b. Find the shortest path from the source vertex 'S' to the remaining vertices in the DAG of Fig. Q3 (b). Use DAG shortest path algorithm. (10 Marks)

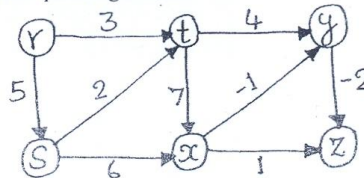


Fig. Q3 (b)

- 4 a. Starting from the flow network shown in the Fig. Q4 (a), find the maximum flow using the basic Ford-Fulkerson algorithm. (05 Marks)

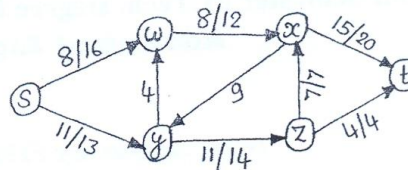


Fig. Q4 (a)

- b. Explain the point-value representation of a polynomial with examples. (07 Marks)
- c. Give the pseudocode for computing GCD of two numbers using extended form of Euclid's algorithm. Also, find GCD (899, 493) and show the computational steps at each level of recursion. (08 Marks)
- 5 a. Define the DFT of a vector and also compute the DFT of the vector (0, 1, 2, 3). (05 Marks)
- b. Define a group and give its properties. Also, write the group table for the multiplicative group modulo $15(\mathbb{Z}_{15}^*, 15)$. (07 Marks)
- c. Write the Chinese remainder theorem. Also, find all integers that leave remainders 1, 2, 3 when divided by 9, 8, 7 respectively using Chinese remainder theorem. (08 Marks)
- 6 a. Write the procedural steps of the RSA public-key cryptosystem. Also, consider an RSA key set with $P = 61$, $q = 53$ and $e = 17$. What value of 'd' should be used in the secret key? What is the encryption of the message $M = 65$? (10 Marks)
- b. Write and explain the Rabin-Karp string matching algorithm. Working modulo $q = 11$, how many spurious hits does the Rabin-Karp matcher encounter for the text $T = 3\ 1\ 4\ 1\ 5\ 9\ 2\ 6\ 5\ 3\ 5\ 8\ 9\ 7\ 9\ 3$ when looking for the pattern $P = 26$? (10 Marks)
- 7 a. Explain string matching with finite automaton. Also, write the state transition diagram and the transition function δ for the string matching automaton that accepts all the strings containing the pattern 'a b a b a c a' and illustrate its operation on the text string 'a b a b a b a c a b a'. (08 Marks)
- b. Compute the prefix function π for the pattern 'a b a b b a b b a b b a b b a b b' in the alphabet $\Sigma = \{a, b\}$ for the Knuth-Morris-Pratt algorithm. (05 Marks)
- c. Apply Boyer-Moore algorithm to search for the pattern 'BAOBAB' in the text 'BESS_KNEW_ABOUT_BAOBABS'. (07 Marks)
- 8 a. Explain the randomizing deterministic algorithms by taking linear search as an example. (10 Marks)
- b. Explain Monte Carlo and Las Vegas algorithms with suitable examples. (10 Marks)

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14SCS24

Second Semester M.Tech. Degree Examination, June/July 2016
Artificial Intelligence and Agent Technology

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

1. a. Define : i) Artificial Intelligence ii) Agent. (04 Marks)
 b. Briefly explain the task domains of AI. (06 Marks)
 c. i) What is an AI technique? Explain with an example.
 ii) What are AI problem characteristics? Explain each with an example. (10 Marks)
2. a. There are two water jugs of 6-litre and 8-litre capacity. Neither has any measuring marker. There is a tap that can be used to fill the jugs with the water. Indicate how 8-litre jug can be filled half. Solve this water-jug problem by giving complete set of production rules and state space tree. (10 Marks)
 b. Differentiate agent function and agent program. Give the structure and agent program for model based reflex agent. (10 Marks)
3. a. Write the procedure for hill-climbing search technique. Explain with a suitable example. Discuss the problems in hill-climbing and the ways of dealing with these problems. (08 Marks)
 b. Explain the different approaches for knowledge representation with an example for each. (08 Marks)
 c. What are the issues in knowledge representation? (04 Marks)
4. a. What do you mean by clause? Describe the steps in converting a sentence in first-order predicate logic (FOPL) into clausal form with an example. (10 Marks)
 b. Consider the following sentences:
 i) Every bird sleeps in some tree.
 ii) Every loon is a bird, and every loon is aquatic.
 iii) Every tree in which any aquatic bird sleeps is beside some lake
 iv) Any thing that sleeps in anything that is beside any lake eat fish.
 Convert the above sentences into wffs in FOPL. Show that the conclusion "Every loon eat fish" using resolution principle. (10 Marks)
5. a. What are non-monotonic reasoning systems? Explain the logic for implementing the same along with issues associated with it. (10 Marks)
 b. State the Bayes theorem and illustrate how it helps in reasoning under uncertainty. (05 Marks)
 c. Write a note on truth maintenance system. (05 Marks)
6. a. What are the advantages of Bayesian networks? Explain with an example. (06 Marks)
 b. Briefly explain : i) Rule based systems ii) Certainty factors. (06 Marks)
 c. Discuss the way reasoning is done using, i) Fuzzy logic ii) Dempster shafer theory. (08 Marks)
7. a. What are frames? Write the frame structure for birthday party. (06 Marks)
 b. What is a semantic net? Write the semantic net for cricket team. (08 Marks)
 c. List and explain the primitive conceptual categories and actions with an example for each. (06 Marks)
8. a. State the optimal decision strategy in games. Write the minimax procedure and explain with an example. (08 Marks)
 b. Distinguish the supervised, unsupervised and reinforcement learning strategy. (06 Marks)
 c. Explain how decisions are made in decision tree with an example. What are the issues to be addressed by decision tree in order to apply it for real world applications? (06 Marks)

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14SCS252

Second Semester M.Tech. Degree Examination, June/July 2016
Information and Network Security

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Explain the Feistel Cipher structure. Also explain the various parameter and design choices which determine the actual algorithm of Feistel Cipher. (12 Marks)
 b. Explain the Avalanche effect. (08 Marks)
- 2 a. Explain with an example the Elgamal cryptosystem. (12 Marks)
 b. Perform encryption and decryption using the RSA algorithm for $p = 3$, $q = 11$, $e = 7$ and $M = 5$. (08 Marks)
- 3 a. Explain the following: i) Caesar cipher ii) Vernam cipher. (10 Marks)
 b. Explain Diffie-Hellman key exchange. (10 Marks)
- 4 a. Explain with neat diagram the general format of X.509 certificate. (08 Marks)
 b. Briefly explain four general categories of scheme for distribution of public keys. (12 Marks)
- 5 a. Differentiate between conventional encryption and public key encryption. (05 Marks)
 b. List and briefly define types of cryptanalytic attacks based on what is known to the attacker. (05 Marks)
 c. Explain packet exchanges and packet formation of secure shell transport layer protocol. (10 Marks)
- 6 a. Explain in detail the IEEE 802.11 WLAN. (10 Marks)
 b. Briefly explain architecture and record protocol operations of secure sockets layer. (10 Marks)
- 7 a. What is S/MIME? Write the functions of S/MIME. (05 Marks)
 b. Explain application of IPsec. (05 Marks)
 c. Explain with a neat diagram encapsulating security payload format. (10 Marks)
- 8 a. Write the differences between version 4 and version 5 of Kerberos. (10 Marks)
 b. Describe the function flow of domain keys identified mail. (10 Marks)

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