

M.TECH. DEGREE EXAMINATION, JULY 2010**First Semester**

Branch : Computer Science and Engineering/Computer Science and Information Systems

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Time : Three Hours

Maximum : 100 Marks

Part A*Answer all questions.**Each question carries 4 marks.*

1. Find a simple NDFA accepting $((ab)^* u(aab)^* \cup aba)^*$.
2. What are fuzzy quantifiers ?
3. Define unconstrained optimization.
4. What are Stochastic process and Markov process ?
5. Explain the Geometric Random Variable.

(5 × 4 = 20 marks)

Part B*Answer all the questions.**Each full-question carries 16 marks.*

6. (a) What are the properties of a Regular Languages ? Explain with examples.
- (b) How to define a Turing Machine and explain importance of Turing Machine ?

Or

- (c) Explain how to check the Ambiguity in a given Language.
 - (d) Show that NP is closed under the UNION, INTERSECTION, CONCATENATION and Kleene star.
7. (a) Explain the difference between Fuzzy Relations and Crisp Relations.
 - (b) Differentiate Fuzzification and Defuzzification with example.

Or

- (c) If $X = \{1, 2, 3, 4\}$ and $Y = \{1, 2, 3, 4, 5, 6\}$ are two universes of discourse and $A = \frac{0.8}{2} + \frac{1}{3} + \frac{0.3}{4}$,

$$B = \frac{0.4}{2} + \frac{1}{3} + \frac{0.6}{4} + \frac{0.2}{3} \text{ the determine the relation for :}$$

IF A, THEN B.

- (d) Discuss the Fuzzy operations defined in Fuzzy sets with examples.

Turn over

8. (a) Define Vector Space. If V is set of real number and \oplus is defined as $u \oplus v = 2u - v$ and \odot by $c \odot u = cu$; then is "V" a Vector space or not? Prove.
- (b) Find the dimension of the Vector space of all ordered pairs of complex numbers.

Or

- (c) Explain with example the constrained and unconstrained optimization problem solving methods.
- (d) Check whether $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$; defined by $T(x, y) = (x + y, x - y, y)$ is a Linear transform. Find Rank and Nullity of T by constructing a basis for the range and null space of T .
9. (a) A Port can service only one ship at a time. But three ships can move over the space. An average of 7 ships arrive each week, according to Poisson Process. The port can handle 8 ships a week with service times exponentially distributed. What is the expected number of ships waiting or in service at the port?
- (b) The 10 booking counters of a Railway Station follows a Poisson pattern with a mean rate of 100 people per hour. The service time at each counter is same and exponentially distributed with mean 10 minutes. Simulate the system for 8 hours to get waiting time statistics in front of the 10 counters of the Railway station.

Or

- (c) Define homogeneous Markov chain and the transition rate matrix with examples.
- (d) Explain the characteristics of queueing model and what is the discrete event simulation.
10. (a) Explain the $M|M|I$ queue. Find the expected waiting time of a customer in the $M|M|I$ queue and hence using Little's formula determine the expected number of customers in the queue.
- (b) What is Pollaczek-Khintchine transform and from which derive expression for the average number in the system $E(N)$ for an $M|G|I$ queue assuming deterministic service times $M|D|I$ and then with two-stage Erlang service time distribution ($M|E_2|I$)?

Or

- (c) Explain Non-Markovian queues with examples.
- (d) Obtain the steady-state solution of the $M|M|I$ queueing system.

(5 × 16 = 80 marks)

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M.TECH. DEGREE EXAMINATION, JULY 2010

First Semester

Branch : Computer Science and Engineering/Computer Science and Information Systems

DATA STRUCTURES AND ALGORITHMS

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions, each carries 4 marks.

1. Using Mathematical induction, prove that $2 + 5 + 8 + \dots + (3n - 1) = n(3n + 1)/2$.
2. Show the sequence of rotations required to perform a single right rotation and a double LR rotation in an AVL tree.
3. Write an algorithm to perform depth first search on a graph.
4. Differentiate between divide-and-conquer and dynamic programming method of algorithm design.
5. Define Convex Hull and Topological sort.

(5 × 4 = 20 marks)

Part B

Answer all questions, each carries 16 marks.

6. (a) Define amortized analysis. Explain the various methods used. (10 marks)
- (b) Use Mathematical induction to show that 3^n is a multiple of 5. (6 marks)

Or

- (c) Explain the various asymptotic notations used to measure the complexity of an algorithm. (10 marks)
- (d) Write notes on conditional asymptotic notation. (6 marks)
7. (a) What are B-trees ? Explain the algorithm for inserting an element into a B-tree. (10 marks)
- (b) Show the Red-Black tree that result after successively inserting the keys 41, 38, 31, 12, 19, 8 into an initially empty Red-Black tree. (6 marks)

Or

- (c) Define Binomial Heap. Write an algorithm to find the union of two binomial heaps using an example. (10 marks)
- (d) Write an iterative algorithm to find the inorder traversal of a binary tree. (6 marks)

Turn over

8. (a) What are Spanning Trees ? Explain the algorithm to compute minimal spanning tree of a graph using Kruskal's algorithm. Also analyse its complexity. (10 marks)

(b) Describe the various hashing functions used. (6 marks)

Or

(c) Elaborate the algorithms to compute union and find on 2 sets. (10 marks)

(d) Given a directed graph, how do you determine whether the given graph has strongly connected components. (6 marks)

9. (a) Solve the following 0/1 Knapsack problem using dynamic programming :

Profit $P = (11, 21, 31, 33)$, weight $w = (2, 11, 22, 15)$ capacity of the Knapsack $C = 40$, no. of items $n = 4$. (10 marks)

(b) Explain the backtracking method of algorithm design. (6 marks)

Or

(c) Describe using dynamic programming, how to multiply matrices. (10 marks)

(d) Write the control abstraction for greedy method of algorithm design. (6 marks)

10. (a) What is meant by vertex-cover of a graph ? Show that the vertex-cover problem is NP-hard. (10 marks)

(b) Define class P, NP, NP-complete and NP-hard. (6 marks)

Or

(c) Elaborate the various methods of solving recurrence relation. (10 marks)

(d) Construct a Huffman tree for the weights (3, 7, 9, 12, 15, 20, 25). If the weight 12 is changed to 21, will your algorithm give the optimal result ? (6 marks)

[5 × 16 = 80 marks]

M.TECH. DEGREE EXAMINATION, JULY 2010**First Semester**

Branch : Computer Science and Engineering/Computer Science and Information Systems

OPERATING SYSTEMS

Time : Three Hours

Maximum : 100 Marks

Part A*Answer all questions.**Each question carries 4 marks.*

1. What is a distributed operating system ? Explain the advantages of distributed operating system over centralized operating system.
2. Explain briefly the most important available IPC primitives.
3. What is meant by thrashing ? Explain.
4. Explain with an example how to find an optimal assignment in task assignment approach.
5. Explain the effect of service paradigm on fault tolerance.

(5 × 4 = 20 marks)

Part B*Answer all the questions.**Each question carries 16 marks.*

6. (a) Explain the reasons of popularity of distributed operating system. (8 marks)
- (b) Briefly explain the transparency aspects of distributed operating system. (8 marks)

Or

- (c) Explain any two distributed computing system models. (8 marks)
 - (d) The design of a distributed operating system should be flexible. Give the proper reasons. (8 marks)
7. (a) What are the desirable features of a good message passing system ? Explain. (8 marks)
 - (b) What is meant by Buffering in message passing ? Explain different types of buffering strategies. (8 marks)

Or

- (c) Explain a typical model of Remote Procedure Call. Also explain the implementation of RPC mechanism. (10 marks)
- (d) Explain briefly lightweight RPC. (6 marks)

Turn over

8. (a) Explain different types of consistency models. (10 marks)
(b) What are the advantages of DSM ? Explain. (6 marks)

Or

- (c) Explain the implementation issues of DSM. (8 marks)
(d) Explain different replacement strategies. (8 marks)
9. (a) Describe in detail the issues in designing load-balancing algorithms. (10 marks)
(b) What is process migration ? Explain. (6 marks)

Or

- (c) Explain briefly process migration in Heterogeneous systems. (9 marks)
(d) Briefly explain the models for organizing threads. (7 marks)
10. (a) Explain the desirable features of a good distributed file system. (8 marks)
(b) Explain with figures the file sharing semantics. (8 marks)

Or

- (c) Explain the need for transactions in a file service. (8 marks)
(d) Explain different recovery techniques in files. (8 marks)

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M.TECH. DEGREE EXAMINATION, JULY 2010**First Semester**

Branch : Computer Science and Engineering/Computer Science and Information System

COMPUTER ARCHITECTURE

Time : Three Hours

Maximum : 100 Marks

Part A*Answer all questions.**Each question carries 4 marks.*

1. What is Von-Newmann computational model ?
2. What are various types of Execution Semantics ?
3. Explain the application of Control Dependency graph.
4. What is the importance of instruction pipelining in parallel processors ?
5. Discuss the superscalar instruction issue.

(5 × 4 = 20 marks)

Part B*Answer all questions.**Each full-question carries 16 marks.*

6. (a) What are Computation models and the relationships with the concepts of CM ?
- (b) Explain relationship between concepts of Connection Machines (CM) in the Programming language features.

Or

- (c) Discuss the Multilevel hierarchial framework and extensions.
- (d) What are various types of Execution Semantics and Control Execution sequence ?
7. (a) Explain the importance of language constructs in parallel computing.
- (b) What is the extend of Parallelism that can be achieved through the various levels and types ?

Or

- (c) Explain the traditional basic ways of classification of computers.
- (d) What are the features that cumulatively act for a good parallel architecture ?
8. (a) Clearly explain the principle behind instruction level parallelism with example.
- (b) How do the load and store affect the pipelining process ?

Or

- (c) Discuss the classification of pipelined processing.
- (d) How to preserve the sequential consistency in instruction scheduling ?

Turn over

9. (a) Explain the way in which the integer and Boolean instructions are pipelined.
(b) What are various aspects of implementation of instruction pipelines ?

Or

- (c) What are Multiple Universal FX units in pipelined processors and their implementation ?
(d) Explain the problems in Arithmetic pipeline design.

10. (a) Explain the issues in superscalar design.
(b) How to preserve the sequential consistency of instruction execution ?

Or

- (c) What is meant by Parallel decoding and its application in superscalar processors ?
(d) Explain implementation of superscalar CISC processor.

(5 × 16 = 80 marks)

M.TECH. DEGREE EXAMINATION, JULY 2010**First Semester**

Branch : Computer Science and Engineering

WIRELESS AND MOBILE COMMUNICATION (Elective I)

Time : Three Hours

Maximum : 100 Marks

Part A*Answer all questions.**Each question carries 4 marks.*

1. How does a Hyperframe differ from a Multiframe ?
2. What is CODA file system ?
3. Explain the significance of location management in wireless networks.
4. What is Wireless Application Environment (WAE) ?
5. Define Sync ML-Framework.

(5 × 4 = 20 marks)

Part B*Answer all questions.**Each question carries 16 marks.*

6. (a) Explain the handover mechanism in GSM.
- (b) What is Mobile IP Protocol ?

Or

- (c) Make a comparison of satellite systems with the Fibre Optic Systems. (8 marks)
- (d) What are components of Digital Audio Broadcast System explain the Multimedia Object Transfer Protocol (MOT) ? (8 marks)

7. (a) Discuss a typical architecture for mobile computing Environment. (8 marks)
- (b) Explain the Data Management in WAE. (8 marks)

Or

- (c) Discuss advantages and disadvantages of the Code file system for mobiles. (8 marks)
- (d) Explain the context manager and the Data Management in WAE. (8 marks)
8. (a) Explain the reference model of wireless mobile networks. (8 marks)
- (b) How do the Distance based location update strategy works in the location management schemes. (8 marks)

*Or***Turn over**

- (c) What are the various mobility models ? (8 marks)
- (d) Discuss the distance based location update process. (8 marks)
9. (a) Discuss the Datagram Protocol with suitable example for wireless. (8 marks)
- (b) Make a comparative analysis of WTP class 1 and WTP class 2. (8 marks)

Or

- (c) How does the Wireless Application Environment (WAE) generate a general purpose application Environment ? (8 marks)
- (d) What is the function of WML in integrated WTA ? (8 marks)
10. (a) Explain context aware sensor networks. (8 marks)
- (b) What are SDP and Jini ? (8 marks)

Or

- (c) Explain different operations of PAP and applications. (8 marks)
- (d) Discuss the addressing and communications in content aware services. (8 marks)

[5 × 16 = 80 marks]