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Roll No.

Total Pages : 2

BT-4/J-22

44181

BASICS OF COMMUNICATION

Paper : ES-IT-202A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) What are the differences between simplex, half-duplex, and full-duplex telecommunication and computer networking channels? Explain.
(b) What are the different elements in a communication system? What are the limitations of communication system? Discuss.

2. (a) What do you understand by gain attenuation? How is it converted to decibels? Explain.
(b) What are the different types of noises in communication system? Discuss.

UNIT -II

3. What do you understand by Amplitude Modulation (AM)? What is Modulation index? Explain.

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4. With the simple phasor diagram and block diagram explain the principle of generation of AM. Discuss the advantages and disadvantages of AM over FM.

UNIT-III

5. (a) Explain the Double spotting with reference to radio receivers.
(b) Write a note on IF amplifier.
6. (a) What is Super heterodyne Receiver?
(b) Write a brief note on RF tuning and amplification.

UNIT-IV

7. What is the principle of fiber optical communication? What is the difference between Step Index and Graded Index Fiber? Explain.
8. (a) How Does an Optical Fiber Work? Explain.
(b) Discuss the losses in fiber optic system.
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Total Pages : 4

BT-4/J-22

44182

DISCRETE MATHEMATICS

Paper-PC-IT-204A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) Show that

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}, n \geq 1$$

by mathematical induction.

(b) Construct the truth tables for the following statements (any *two* out of three) :

(i) $(p \rightarrow p) \rightarrow (p \rightarrow \bar{p})$.

(ii) $(p \vee \bar{q}) \rightarrow \bar{p}$.

(iii) $p \leftrightarrow (\bar{p} \vee \bar{q})$.

2. (a) If A, B, C be arbitrary sets, prove that

(i) $(A - B) - C = (A - C) - B$.

(ii) $(A - B) - C = (A - C) - (B - C)$.

(b) John made the following statements :

(i) I love Lucky.

(ii) If I love Lucky, then I also love Vivian.

Given that John told the truth or lied in both cases; determine whether John really loves Lucky.

UNIT-II

3. (a) Let $A = \{\text{Fine, Yang}\}$ and $B = \{\text{president, vicepresident, secretary, treasurer}\}$. Give each of the following :
- (i) $A \times B$.
 - (ii) $B \times A$.
 - (iii) $A \times A$.
- (b) Let R be the relation from A to B , and let A_1 and A_2 be subsets of A . Prove that
- (i) If $A_1 \subseteq A_2$ then $R(A_1) \subseteq R(A_2)$.
 - (ii) $R(A_1 \cup A_2) = R(A_1) \cup R(A_2)$.
4. (a) Let the relation $(x, y) \in R$, if $x \geq y$ defined on set of positive integers. Is R a partial order relation? Prove or disprove it.
- (b) Suppose that R and S are relation from A to B . Prove that
- (i) If $R \subseteq S$, then $R^{-1} \subseteq S^{-1}$.
 - (ii) $(R \cap S)^{-1} = R^{-1} \cap S^{-1}$.

UNIT-III

5. (a) Prove that if $f : A \rightarrow B$ and $g : B \rightarrow C$ are one-to-one functions, then $g \circ f$ (composition function of g and f) is one-to-one.
- (b) Find the total distinct numbers of six digits that can be formed with 0, 1, 3, 5, 7 and 9 and how many of them are divisible by 10?

6. (a) Solve the recurrence relation

$$a_n - 7a_{n-1} + 10a_{n-2} = 0, a_0 = 0 \text{ and } a_1 = 3$$

by using generating function, where $n \geq 2$.

- (b) Let $f : A \rightarrow B$ and $g : B \rightarrow C$ be functions. Show that $g \circ f$ (composition function of g and f) is onto, then g is onto.

UNIT-IV

7. (a) Define the following :

- (i) Abelian group.
- (ii) Normal subgroup.
- (iii) Cyclic group.

- (b) If G is a set of real numbers (non-zero) and let

$$a * b = \frac{a.b}{2}, \text{ show that } (G, *) \text{ is an Abelian group.}$$

8. (a) Let H is a subgroup of a group G , prove that the left cosets aH, bH of H in G , are either disjoint or are identical.
- (b) Let $(A, +, \cdot)$ be a ring such that $a \cdot a = a$ for all a in A
- (i) Show that $a + a = 0$ for all a , where 0 is the additive identity.
- (ii) Show that operation \cdot is commutative
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Total Pages : 3

BT-4/J-22

44183

OPERATING SYSTEMS

Paper-PC-IT-206A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) Identify and explain the roles of the following :
 - (i) PCB creation of processes. (3)
 - (ii) Context switching. (3)
 - (iii) Process hierarchies. (3)
- (b) What are the prime objectives of using scheduling?
How preemptive and non-preemptive scheduling works?
Briefly explain each of them. (6)

2. (a) Explain the following CPU scheduling algorithms :
 - (i) SJF. (3)
 - (ii) FCFS. (3)
 - (iii) Round Robin. (3)
- (b) Elaborate the roles of interrupts in operating systems.
Discuss the technicalities of using various interrupts mechanisms in operating systems. (6)

UNIT-II

3. (a) Define the deadlock states. Explain the scientific procedures of the following :
- (i) Deadlock avoidance. (4)
 - (ii) Deadlock prevention. (4)
- (b) Write and explain the solution for Reader-Writer classical synchronization problem using monitors. (7)
4. (a) What are the race conditions and write down the technical note on the mutual exclusion. (5)
- (b) Write and explain the Dining Philosophers Problem. Also, provide the solution for this problem using semaphores. (5)
- (c) Why monitors and message passing mechanisms are valuable in any type of inter-process communication? (5)

UNIT-III

5. (a) Write short on the following :
- (i) Demand paging. (4)
 - (ii) Virtual memory. (4)
- (b) What is a page-fault? List all the steps of how a page-fault is serviced by the operating system. (6)
6. (a) Consider the following page reference string : 1, 2, 3, 4, 2, 1, 5, 6, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for the LRU, FIFO, LFU and optimal page replacement algorithms assuming two and five frames? (9)

- (b) Explain the concept of Virtual memory. List any *two* methods for its implementation and explain any *one* of them with the help of a schematic diagram. (6)

UNIT-IV

7. (a) Draw and explain the flow of activity that takes place during a Remote Procedure Call (RPC) between two networked, systems. (8)
- (b) Differentiate between the following :
- (i) Logical and physical file systems.
 - (ii) Disk space management and file system management. (7)
8. (a) What is basic role of software and hardware in the security of distributed file systems? How will the distributed file systems be protected from an unauthorized use and virus attacks? (8)
- (b) Write short notes on the following :
- (i) Buffering.
 - (ii) Network operating system and NFS. (7)
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BT-4/J-22

44184

MICROPROCESSOR INTERFACING & APPLICATION

Paper-PC-IT-208A

Opt. (II)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all by selecting at least *one* question from each unit.

UNIT-I

1. (a) With the help of neat diagram explain the architecture of 8085 microprocessor in detail. (8)
- (b) Explain the flag register of 8085 microprocessor, in detail. (7)

2. (a) Explain the memory organization in 8085 microprocessor. (7)
- (b) With timing diagram, explain the memory write operation in 8085 microprocessor. (8)

UNIT-II

3. (a) Write an 8085 assembly language program to generate a software time delay of 100 ms.

- (b) Specify the contents of the registers and the flag status as the following instructions are executed :
 - (i) MVI A, 00H.

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- (ii) MVI B, F8H.
- (iii) MOV C, A.
- (iv) MOV D, B.
- (v) HLT. (8)

4. (a) Explain the following instructions with suitable example of each :
- (i) LXI (ii) MOV (iii) SHLD (iv) LDAX (v) CMP (vi) STA. (12)
- (b) Explain the sequence of events during the execution of the RET instruction by 8085 processor with the help of neat timing diagram. (3)

UNIT-III

5. (a) Write short note on vectored interrupts of 8085 microprocessor. (8)
- (b) With suitable examples explain how I/O devices are connected using memory mapped I/O and peripheral I/O. (7)
6. Interface multiplexed 4 digit seven segment display with 8085 microprocessor. (15)

UNIT-IV

7. Draw the block diagram of 8237 DMA controller and explain its working. (15)
8. Explain the interfacing of LCD displays with 8085 microprocessor. (15)

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Total Pages : 3

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44185

DATABASE MANAGEMENT SYSTEM
Paper-PC-IT-210A

Time : Three Hours]

[Maximum Marks : 75

Note : Students will be required to attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) Write the advantages of Database Management System (DBMS) over Traditional File Processing System.
(b) Outline and explain the component of three tier architecture of DBMS. (8+7=15)

2. Differentiate between the following :
 - (a) Primary Key and Super Key.
 - (b) Strong Entity and Weak Entity.
 - (c) Composite and Multivalued Attribute.
 - (d) Specialization and Generalization. (3+4+4+4=15)

UNIT-II

3. (a) Write queries for the following tables :
T1 (Empno, Ename, Salary, Designation)
T2 (Empno, Deptno.)

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- (1) Display all the details of the employee whose salary is lesser than 10K.
 - (2) Add a new column Deptname in table T2.
 - (3) Find the total salary of all the employees.
 - (4) Display Empno, Ename, Deptno and Deptname.
 - (7) Drop the table T1.
- (b) Why views are used? Write the syntax to create, delete and modify view. (8+7=15)
4. (a) List the operations of relational algebra and write the purpose and syntax of each.
- (b) Differentiate between tuple relational calculus and domain relational calculus. (8+7=15)

UNIT-III

5. (a) What is canonical cover? Consider following set F of functional dependencies on schema R (A, B, C) and compute canonical cover for F.
- $A \rightarrow BC$ $B \rightarrow C$ $A \rightarrow B$ $AB \rightarrow C$.
- (b) Explore the different types of anomalies in designing a database. (8+7=15)
6. What do you mean by BCNF? Why it is used and how it is different from 3NF? Discuss BCNF and 3NF with suitable illustration. (15)

UNIT-IV

7. (a) Consider schedule S with transaction T1 and T2. T1 transfer Rs. 150 from account A to C and T2 adds Rs. 50 into account A. Prepare concurrent schedule with two phase locking protocol.
- (b) What is concurrency? Briefly explain the lost-update problem of concurrency? (8+7=15)
8. (a) What is deadlock? Explain wait-die and wound-wait for deadlock prevention.
- (b) Explain deferred database modification for log based recovery. Explain role of check point in log base. (8+7=15)
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Total Pages : 03

BT-6/J-22

46154

ANALYSIS AND DESIGN OF ALGORITHMS
IT-302N/PE-IT-S310A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) What is the difference between Big(O) and Omega notation ? Explain using suitable examples.
(b) Write the algorithm for transpose of a matrix $m \times n$ and determine the time complexity of the algorithm using frequency count method.
2. (a) What is meant by divide and conquer approach ? Write divide and conquer recursive algorithm of quick sort and compute its time complexity.
(b) Explain the properties of an algorithm with an example and describe the Algorithm Analysis of Binary Search.

Unit II

3. (a) Distinguish between Dynamic Programming and Greedy Method.
(b) What are the principles of optimality ? Explain, how travelling sales person problem uses the dynamic programming technique with example.
4. (a) State the Greedy Knapsack. Find an optimal solution to the Knapsack instance $n = 3$, $m = 20$, $(P_1, P_2, P_3) = (25, 24, 15)$ and $(W_1, W_2, W_3) = (18, 15, 10)$.
(b) Write the control abstraction of greedy method.

Unit III

5. (a) Write the backtracking algorithm for N-queen's problem. Give time and space complexity for 8-queen's problem.
(b) Explain the 0-1 Knapsack solution using Branch and Bound Method.
6. (a) Write notes on the following :
 - (i) LC-Search
 - (ii) Branch and Bound (BB)
 - (iii) FIFO-BB.
(b) What is a Hamiltonian Cycle ? Explain how to find Hamiltonian path and cycle using backtracking algorithm.

Unit IV

7. (a) What is a graph ? Write the breadth first search algorithm for graph traversal and compute its space complexity.
- (b) What is the difference between B tree and B+ tree ? Discuss the insertion operation in B+ tree.
8. (a) What is Binary Search Tree (BST) ? Write the algorithm for insertion and deletion of node in BST.
- (b) Give the definition of NP-complete. Prove that TSP is NP-complete.

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Total Pages : 03

BT-6/J-22

46155

SOFTWARE ENGINEERING

PC-IT-302A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each of the four Sections (A-D).

Section A

1. (a) Discuss the prototyping model. What is effect of designing a prototype on the overall cost of the software project ? 8
- (b) Describe the type of situation where iterative enhancement model might lead to difficulties. 7
2. (a) Differentiate between user and system requirements. 7
- (b) Describe the requirements change management process in detail. 8

Section B

3. (a) What are the different categories of software according to COCOMO estimation model ? Compute the nominal effort and development time for 1 million lines of code in semi-detached software category. 4+4

(b) What is modularity ? State its importance and also explain the differences between coupling and cohesion. 3+4

4. Draw data flow diagrams, class diagram and corresponding object diagrams for the following problem :

“Guests can reserve rooms in a hotel in advance or on spot depending upon the availability. The operator would add data pertaining to the guests such as name, arrival time; balance paid and type of room (i.e. AC, non-AC, Deluxe, suit). The SW should uniquely assign a token number on allotment of room. The hotel catering services manager would input the quantity and type of the food items as and when consumed by the guests along with the token number of the guest and corresponding date and time.” 15

Section C

5. (a) What is meant by software quality management ? Explain the difference between ISO and SEI-CMMI approach for software quality. 9

(b) Explain the following terms in detail :

(i) Reliability growth modeling 3

(ii) Code Review Techniques. 3

6. Consider the process of ordering the food over the phone. Draw the use case diagram and also sketch the activity

diagram representing each step of the process, from the moment you pick up the phone to the point where you start eating the food. Include activities that others need to perform. Add exception handling to the activity diagram you developed. Consider at least *two* exceptions (e.g. delivery person wrote down address, delivery person brings wrong food). 15

Section D

7. (a) Design a block box test case suit to test a program which finds the age of a person by taking date of birth as an input. Draw a control flow graph of your program and find its Cyclomatic Complexity (CC). 5+5
- (b) Differentiate between software verification and validation process. 5
8. What are the different types of software maintenance that a software product might need ? Explain the different maintenance process model used. 15

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BT-6/J-22

46172

MOBILE COMPUTING
PE-IT-S312A/PE-CS-S312A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) Explain evolution of mobile systems and design considerations for mobile computing. 9
- (b) What is hand-off ? Explain various types and issues therein. 6
2. (a) Explain the concept of HLR and VLR. 6
- (b) Explain the four sub-systems of GPRS system architecture. What are protocol layers between BSS and SGSN in GPRS ? 9

Unit II

3. (a) Explain the working IEEE802.11 MAC. 7
- (b) What are different entities in mobile IP ? Show various types of encapsulation done here. 8

4. (a) What is WAP ? Describe WAP protocol stack and its architecture. 8
- (b) Why cannot we use TCP directly over wireless. Suggest some improvements. 7

Unit III

5. (a) Explain the need of data replication for mobile computers. 7
- (b) Discuss resource management, scheduling and load balancing in cloud. 8
6. (a) What are issues in mobile transaction processing ? 7
- (b) Explain the need of map reduce for simplified data processing. 8

Unit IV

7. (a) What are the concepts in reactive and proactive routing protocols in MANET ? 9
- (b) Explain the working of DSR. 6
8. (a) What is the reason of AODV protocol being immensely popular ? Discuss. 9
- (b) What are challenges in MANET routing protocols ? 6

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Total Pages : 02

BT-6/M-22

46212

LINUX OPERATING SYSTEM

PC-IT-304A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) What is Operating System ? Explain different types of command in Linux OS. 7
- (b) What do you mean by shell in Linux OS ? Write different types of shell used in Linux. 8
2. (a) Differentiate between LILO and GRUB boot loaders. 7
- (b) Explain the APT package installation, remove, upgrade and query. 8

Unit II

3. What is NIS and NFS in Linux ? Explain in detail and also write merits and demerits of both. 15
4. Explain TCP/IP protocol and address resolution protocol (ARP) in detail with example. 15

Unit III

5. (a) What is Shell Script ? Write a shell script to check whether the string is palindrome or not. 8
- (b) What is LDPA and why is it called light weight ? 7
6. Explain the following : 15
- (a) SMB/CIF protocols
- (b) Domain Controller
- (c) Dual boot running windows and Linux on same PC.

Unit IV

7. (a) What is DMZ and why would we use it in Linux OS ? 7
- (b) Explain Intrusion detection system in Linux. 8
8. Differentiate between SMTP, IMAP and POP3 servers in detail. 15

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Total Pages : 02

BT-6/J-22

46215

BIG DATA ANALYTICS

PE-IT-S306A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Discuss the 4 V's of Big Data. 8
(b) What is distributed file system ? Explain. 7
2. (a) Briefly discuss about Big Data and its importance. 8
(b) What are the various applications of Big Data ?
Explain. 7

Unit II

3. (a) What is Apache Hadoop technology ? Explain. 8
(b) How is data moved in and out of Hadoop ? Discuss. 7
4. (a) How is Big Data managed by Hadoop Ecosystem ?
Explain. 8

- (b) How is Map-Reduce function used to process input data and give output results ? 7

Unit III

5. (a) What is Name Node and Data Node in Hadoop ? Explain. 8
(b) What is Secondary Name Node ? What is the role of Secondary Name Node ? 7
6. (a) Differentiate between Job Tracker and Task Tracker. 8
(b) How is a Map-Reduce task processed in HDFS ? 7

Unit IV

7. Explain Hadoop YARN architecture in detail. 15
8. Explain various components of Hadoop ecosystem version 2.0 in detail. 15

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Total Pages : 03

BT-6/M-22
E-COMMERCE
OE-IT-306-A

46221

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section. All questions carry equal marks.

Section A

1. (a) Explain the various categories of e-commerce. Define the role of e-Commerce in business, service, learning and community. 6+4
- (b) Explain the e-Commerce framework and its application. 5

2. (a) Explain the system architecture of e-Commerce by looking at it as a set of layers with the physical network at the bottom layer and applications at the top layer. 10
- (b) Explain C2C e-Commerce with an appropriate example. 5

Section B

3. (a) What are two major EDI standards used in e-Commerce ? Which is the standard accepted for Government transactions in India ? 4+4
- (b) Explain B2B e-Commerce using an example of a book distributor who stocks a large number of books, which he distributes via a large network of book sellers. Assume that the distributor has stocks of books of a large number of publishers and book seller's order books as and when their stock is low. Distributors give 1 month's time to booksellers for payment. 7
4. (a) What are the main characteristics of internet-based EDI ? 5
- (b) Explain with labelled diagram about secure electronic transaction protocol. 10

Section C

5. (a) How preserving confidentiality and integrity ensures security in e-Commerce ? Discuss various mechanism used to ensure data and message security in e-Commerce systems. 5+5

- (b) What is Cryptography ? How cryptography can be used to ensure data and message transaction in e-Commerce ? 2+3
6. (a) What does the properties like ubiquitous, richness and information density in e-Commerce means ? Support your answer with example. 8
- (b) How WWW architecture encompasses the global hypertext publishing, universal reader and client-server concepts ? 7

Section D

7. (a) What is digital wallet ? How can it be used in e-Commerce ? What issues need to be considered while designing electronic payment system ? 5+5
- (b) How does e-cash work ? List the properties that an e-cash should have ? 5
8. Why is a different payment system needed for small payment for internet services ? Explain how one such system functions. How does the system make sure that payment is made only after information for which payment has been made is actually delivered to the customer ? 3+5+7

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BT-8/M-22

48360

CYBER SECURITY

Paper-OE-IT-402A

Time Allowed : 3 Hours]

[Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT-I

1. (a) What do you understand by cyber crime? Discuss in brief the different types of cyber crime.
- (b) What is CIA triad? What are the three principles of it? Discuss its significance in information security.
2. (a) What is dark web? How is it used by cyber criminals? Discuss.
- (b) Define risk. How is security risk analysis performed? Discuss.

UNIT-II

3. (a) Write the brief notes on following :
 - (i) Buffer overflow attack
 - (ii) Sql injection attack.
- (b) What is cyber stalking? What are the different types of it? Discuss the approaches to prevent it.

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P. T. O.

4. (a) What do you understand by obscenity in Internet? Discuss the legal provisions in India against sharing of obscene content.
- (b) What is steganography? What are its applications? What are the threats of steganography? Discuss.

UNIT-III

5. (a) What is the difference between active attack and passive attack? Discuss in brief the method to prevent the cyber crime.
- (b) Write short notes on the following :
- (i) Spam mail
 - (ii) Intrusion Detection System (IDS).
6. (a) What do you understand by access control? How is it used in implementing the security in operating systems? Discuss.
- (b) What is Firewall? What are the different types of it? What are its limitations?

UNIT-IV

7. (a) What is forensic? What is digital forensics? Discuss in detail the need of it.
- (b) Write a detailed note on Indian IT Act.
8. (a) What is non-repudiation? What do you understand by digital signature? Can a digital signature be used for non-repudiation? Discuss.
- (b) What is the need of digital forensic? Write a note on digital forensic process.

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BT-8/M-22

48364

INFORMATION SECURITY

Paper-OE-IT-410A

Time Allowed : 3 Hours]

[Maximum Marks : 75

Note : Attempt five questions in all, selecting at least one question from each Unit. All questions carry equal marks.

UNIT-I

1. What is the need for computer security? Discuss different types of security attacks. Elaborate security mechanism with the help of network security model. 15
2. (a) What is cryptography and stenography? Distinguish between symmetric and asymmetric key cryptography. 8
- (b) How would you quickly test a piece of ciphertext to suggest whether it was likely the result of a transposition? 7

UNIT-II

3. (a) Briefly explain the following : 10
 - (i) Block Cipher Cryptography
 - (ii) Location and placement of encryption function.
- (b) Write a note on differential and linear cryptanalysis. 5

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P. T. O.

4. Explain the principles of public key crypto systems. Discuss the protocol used for RSA key exchange. Why is Diffie-Hellman better than RSA? 15

UNIT-III

5. (a) Define hashing function. Discuss the properties of hashing function in cryptography. Explain secure Hashing Algorithm (SHA). 10
(b) Discuss Knapsack algorithm. 5
6. (a) What problem was Kerberos designed to address? Explore the principal differences between version 4 and version 5 of Kerberos. 10
(b) What do you understand by biometric authentication? 5

UNIT-IV

7. (a) Discuss handshake protocol and change-ciphers spec protocol of Secure Socket Layers (SSL). 8
(b) What is meant by E-mail security? Write a note on S/MIME. 7
8. (a) What do you mean by virus and firewall? Discuss different type of viruses and firewall. 8
(b) Explore the different types of Intrusion Detection System (IDS). What are IDS limitations? 7