

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Attempt any four questions out of remaining six questions.
 (3) Assume suitable data wherever required.

1. (a) Explain the following terms related to robot :- 10
 DOF, Reach, stroke, tool orientation, precision, accuracy, repeatability, load carrying capacity, speed, work envelope.
- (b) How are robots classified ? 5
- (c) Differentiate between soft and hard automation. 5

2. (a) Compute the joint variable vector $q = [q_1, q_2, q_3, q_4]^T$ for the following tool configuration vector of SCARA. $W(q) = [203.4, 662.7, 557, 0, 0, -1.649]^T$ 10
- (b) Explain the process of linear interpolation with parabolic blends. 10

3. (a) Using D-H Algorithm, perform direct kinematic analysis of 5 axis RHINO XR3 robot. 10
- (b) Explain the principle and applications of edge detection techniques using gray scale image. 10

4. (a) Explain bounded deviation algorithm for achieving straight line motion. 10
- (b) Describe the solution of inverse kinematic problem of a 2-axis planar robot. 10

5. (a) Explain work space analysis of 5-axis RHINO-XP3 robot by finding the maximum and minimum bounds. 10
- (b) Derive the general link co-ordinate transformation matrix T_{K-1}^K . 10

6. (a) Explain the PNP motion trajectory in details. 10
- (b) Explain the effect of Moment of Inertia on the dynamic performance of a robot. 10

7. Write short notes on :- 20
 - (a) Screw Transformation
 - (b) Robot Programming
 - (c) Shrink and Swell Operators
 - (d) Gross Motion Planning.

10

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 (3) **Figures** to the **right** indicate **full** marks.
 (4) Answers to the questions should be **grouped** and written **together**.
 (5) Assume **suitable** data if **necessary** and clarify.

System Security

1. (a) What is a product Cipher ? 5
- (b) List at least three kind damage a company could suffer when the integrity of a program or company data is compromised. 5
- (c) What do you mean by operating system and application finger printing ? 5
- (d) Describe Memory and Address protection. 5

2. (a) Using the RSA algorithm, encrypt the following :- 10
 - (i) $p = 3, q = 11, e = 7, p = 12$
 - (ii) $p = 7, q = 11, e = 17, p = 25$
 - (iii) Find the corresponding ds for (i) and (ii) and decrypt the Ciphertexts.
- (b) (i) Explain how the use of cookies thwarts a denial-of-service (DOS) attack in the Diffie-Hellman exchange. 5
- (ii) Explain how authentication thwarts the man-in-the-middle attack. 5

3. (a) What are the contents of a security plan ? 6
- (b) Describe the steps of a Risk Analysis. 6
- (c) What are the security requirements from the database system ? 8

4. (a) When is IPSec appropriate ? When is SSL/TLS appropriate ? 10
- (b) What makes a network vulnerable ? 10

5. (a) What do you mean by Stealth Mode IDS ? Describe IDS strengths and limitations. 10
- (b) Define the term Ethics. What is difference between Laws and Ethics ? What is IEEE code for Ethics ? 10

6. (a) List and explain the various malicious codes and Non-malicious codes. 10
- (b) Describe different types of firewalls with design, configuration and limitations. 10

7. Write a details note on (any two) :- 20
 - (a) DES
 - (b) Security of HASH functions and MACS
 - (c) Public-key Infrastructure (PKI).

Con. 3839-10.

AN-3154

(3 Hours)

[Total Marks : 100

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Data Warehousing & Mining

1. (a) Define Data Warehouse with features. Explain the architecture with suitable block diagram. **10**
- (b) Consider the transaction database given below. Use Apriori Algorithm with min-sup = 60% and min-confi = 80% **10**

Transaction-id	Items
T1	K, A, D, B
T2	D, A, C, E, B
T3	C, A, B, E
T4	B, A, D.

2. (a) What is dimensional modelling ? What is slowly changing dimensions ? How this problem is solved ? Give example. **10**
- (b) Consider a data warehouse for a hospital, where there are three dimensions. Doctor, patient and time, and two measures count and charges, where charge is the fee that doctor charges a patient for a visit. **10**
- Using the above example describe the following OLAP operations :-
- (i) Slice
 - (ii) Dice
 - (iii) Rollup
 - (iv) Drill down
 - (v) Pivot.
3. (a) State key issues to be considered while planning for data warehouse. Explain any four of them. **10**
- (b) What is Web Mining ? Explain Web Usage mining. **10**

4. (a) Why Metadata is important ? What is Business Metadata and Technical Metadata ? 10
- (b) Given the training data for height classification, classify the tuple $t = \langle \text{Adam, M, 1.97} \rangle$ using Bayesian classification. 10

Name	Gender	Height	Output
Kristina	F	1.6 m	Short
Jim	M	2 m	Tall
Maggie	F	1.9 m	Medium
Martha	F	1.88 m	Medium
Stephanie	F	1.7 m	Short
Bob	M	1.85 m	Medium
Kathy	F	1.6 m	Short
Dave	M	1.7 m	Short
Warth	M	2.2 m	Tall
Steven	M	2.1 m	Tall
Deffie	F	1.8 m	Medium
Todd	M	1.95 m	Medium
Kim	F	1.9 m	Medium
Amy	F	1.8 m	Medium
Wynette	F	1.75 m	Medium

5. (a) Explain ETL of data warehousing in detail. 10
- (b) What is clustering ? Explain K means clustering algorithm. 10
 Suppose the data for clustering is {2, 4, 10, 12, 3, 20, 30, 11, 25} consider $K = 2$, cluster the given data using above algorithm.
6. (a) What is Web Structure mining ? What are techniques used for it ? What are authoritative and hub pages ? 10
- (b) What is KDD ? Explain KDD process with neat diagram. 10
7. Write short notes on : (any two) – 20
- (a) Comparison between OLAP and OLTP
 - (b) Spatial Mining
 - (c) Snowflake Schema.

Con. 3232-10.

AN-3148

D.C.
(3 Hours)

[Total Marks : 100

Distributed Computing

- N.B. : (1) Question No. 1 is compulsory.
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1. (a) What is CORBA ? Explain its general architecture. 10
 (b) Explain RPC mechanism. Explain RPC semantics in case of failure 10
2. (a) What are the different goals of distributed system? Explain how are these goals implemented in the distributed system 10
 (b) Compare NOS and DOS with suitable diagram 10
3. (a) What is totally ordered multicasting ? How Lamport clock is implemented 10
 (b) Explain the need for Co-ordinator in distributed system. Explain the election algorithm. 10
4. (a) What are the various forms of message oriented communication? Give example of each. 10
 (b) Explain attacks and security threats in distributed system. 10
5. (a) Explain code migration and role of mobile agents. 10
 (b) Explain the process of concurrency control using pessimistic and optimistic time stamp ordering. 10
6. (a) What is name resolution ? Explain various ways of name resolution. 10
 (b) Explain distributed algorithm for mutual exclusion .What are the advantages and the disadvantages of it over centralized algorithms. 10
7. Write notes on: (any two) 20
 - i) CODA file system.
 - ii) Fault tolerance.
 - iii) Parameter passing in RMI.
 - iv) NFS file system.

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Neural Networks and fuzzy Systems

- Q.1 (a) A neuron with 4 inputs has the weight vector $w = [1, 2, 3, 4]^t$. The activation function is linear, that is, the activation function is given by $f(\text{net}) = \text{net}$. If the input vector is $X = [5, 6, 7, 8]^t$, then find the output of the neuron. 05
- (b) Model the following as fuzzy set using suitable membership function - "numbers close to 5". 05
- (c) Define with examples the terms Projection and Cylindrical Extension in a fuzzy relation. 05
- (d) Differentiate between the membership functions T function and Zadeh's S function. 05
- Q.2 Design a fuzzy controller to determine the wash time of a domestic washing machine. Assume that the inputs are dirt and grease on clothes. Use three descriptors for each input variable and five descriptors for the output variable. Device a set of rules for control action and defuzzification. The design should be supported by figures wherever possible. Clearly indicate that if the clothes are soiled to a larger degree the wash time required will be more. 20
- Q.3 (a) What is learning in neural networks? Compare different learning rules. 10
- (b) Explain error back propagation training algorithm with the help of a flowchart. 10
- Q.4 Determine the weights after three iterations for hebbian learning of a single neuron network starting with initial weights $w = [1, -1]$, inputs as $X_1 = [1, -2]$, $X_2 = [2, 3]$, $X_3 = [1, -1]$ and $c = 1$.
 Use (i) Bipolar binary activation function
 (ii) Bipolar continuous activation function 20
- Q.5 (a) Describe the basic Hopfield model and give the theory of energy minimization in auto-associative Hopfield network. 10
- (b) Explain the architecture of Bidirectional associative memory. How is storage and retrieval performed in BAM? 10
- Q.6 (a) Explain RBF network and give the comparison between RBF and MLP. 10
- (b) Explain with suitable examples linearly and non-linearly separable pattern classification. 10
- Q.7 Write notes on **any two** of the following 20
- (i) Fuzzy Knowledge based Controller
 - (ii) Defuzzification Methods
 - (iii) Character recognition using neural networks
 - (iv) Medical diagnosis using neural networks