

(2 ½ Hours)

[Total Marks: 60]

- N.B:**
- (1) **All questions are compulsory.**
 - (2) Figures to the **right** indicate full marks.
 - (3) **Assume additional data if necessary** but state the same clearly.
 - (4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.
 - (5) Use of **calculators** and statistical tables are **allowed**.

- Q.1 Attempt **any two** of the following (12)
- a) Illustrate the operations of INSERTION SORT for {40, 23, 45, 21, 45}. 6
 - b) Write a short note on Hiring problem. 6
 - c) What is Time complexity and Space Complexity? 6
 - d) Write a pseudo code for Strassen's algorithm. 6
- Q.2 Attempt **any two** of the following (12)
- a) What are the characteristics of Dynamic Programming? 6
 - b) Discuss running time complexity for Bellman Ford algorithm. 6
 - c) Write a short note on BFS. 6
 - d) Write a short note on Dijkstra Algorithm. 6
- Q.3 Attempt **any two** of the following (12)
- a) Discuss the Travelling salesman problem. 6
 - b) Explain the Vertex cover problem. 6
 - c) Prove that if $a > b > 0$ and $c = a + b$, then $c \bmod a = b$. 6
 - d) Write a short note on Running time of Euclid algorithm. 6
- Q.4 Attempt **any two** of the following (12)
- a) Explain the purpose of review literature in Research. 6
 - b) What is internet research? 6
 - c) Write a short note on research ethics. 6
 - d) Write a short note on presentation of research. 6
- Q.5 Attempt **any two** of the following (12)
- a) How algorithm is analyzed? 6
 - b) Write a short note on DFS. 6
 - c) Explain set covering problem in short. 6
 - d) What is the role of data analysis in research? 6

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Q.1 Attempt **any two** of the following (12)

- a) Which services are provided by TCP to application layer? Explain any one. 6
- b) What is DNS? How DNS server works? 6
- c) Define Switching. Explain concept of Virtual Circuit in Switching? 6
- d) What is IPv4 Protocol? Explain IPv4 header format with diagram. 6

Q.2 Attempt **any two** of the following (12)

- a) Explain the virtualization components and their functionality with the help of diagram 6
- b) What are the desirable properties of network virtualization? Explain in relation to generic routing encapsulation. 6
- c) What are the drawbacks of VLAN, which led to the development of network virtualization? 6
- d) Explain the routing protocols in network virtualization. 6

Q.3 Attempt **any two** of the following (12)

- a) Write short note on Bluetooth Technology. 6
- b) Write short note on Wireless PAN. 6
- c) Explain SCO and ACL Bluetooth links in detail. 6
- d) Write short note on Destination Sequenced Distance-Vector protocol. 6

Q.4 Attempt **any two** of the following (12)

- a) Explain the sensing and communication range of WSN. 6
- b) Explain the clustering of Sensor Nodes. 6
- c) What do you understand by regularly placed sensors 6
- d) Describe the network issues of WSN. 6

Q.5 Attempt **any two** of the following (12)

- a) Define Internet. Explain Internet Standards. 6
- b) What is network virtualisation and elaborate the need for external and internal network virtualization. 6
- c) Explain Active and Passive Attack in adhoc network. 6
- d) Explain any 3 applications of WSN 6

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Q.1 Attempt **any two** of the following (12)

- a) Explain how distributed database system are better than Centralized database with referenced to following points: **6**
 - i. Proximity of data to its points of use.
 - ii. Parallelism in execution.
- b) List and justify challenges of replication in concurrency for distributed database system. **6**
- c) What issues must be considered in optimizing queries over distributed data, in addition to where the data is located? **6**
- d) In distributed database a relation can be fragmented and replicated. Explain these concepts and how they differ. **6**

Q.2 Attempt **any two** of the following (12)

- a) What do we need to consider in optimizing queries for parallel execution? Explain concept of inter operation parallelism with appropriate example. **6**
- b) Discuss deadlock detection in a distributed database. **6**
- c) Explain in brief how local recovery management deals with update/write operations. Explain with example any one method used in In-place update with appropriate example. **6**
- d) Explain and differentiate between the term scale-up and speed-up in parallel query evaluation. **6**

Q.3 Attempt **any two** of the following (12)

- a) Explain the following concepts in context of Object-oriented databases **6**
 1. Unstructured Complex Object,
 2. Structured Complex Object.
- b) Define Spatial Database. Explain in brief logical data model. **6**
- c) Describe in brief Time ontology with suitable illustration. **6**
- d) What is R-tree? What is the structure of data entries in R-tree? How can we minimize the overlap between bounding boxes when splitting nodes? **6**

- Q.4 Attempt **any two** of the following (12)
- a) Described in detail generalized model of active database. 6
 - b) Define safe datalog program. Explain features of safe datalog program. 6
 - c) What is XML? Describe with suitable illustration structure of XML data. 6
 - d) Write a short note on Clausal form and Horn clauses. 6
- Q.5 Attempt **any two** of the following (12)
- a) Describe in detail Architectural models for DDBMS. 6
 - b) Differentiate between intra operations parallelisms and inter operation parallelism. 6
 - c) Distinguish between a relational database and an object database. 6
 - d) What is spatial data? State and explain in brief common types of analysis performed on spatial data. 6

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- Q.1 Attempt **any two** of the following (12)
- a) Explain “ Robot is AUTONOMOUS system” 6
 - b) Explain the components of robot in detail with neat diagram. 6
 - c) Explain how the Braitenberg’s Vehicles react to light. 6
 - d) Explain the need of actuator in robots. Differentiate between active and passive actuation with example 6
- Q.2 Attempt **any two** of the following (12)
- a) Explain degree of freedom? How many DOF are there in the human hand? 6
 - b) Define feedback control? Discuss the following P,PD,PID feedback 6
 - c) Explain properties of Laser and note on LaserSensing. 6
 - d) What are shaft Encoders? Explain reflectance shaft encoder techniques. 6
- Q.3 Attempt **any two** of the following (12)
- a) State and explain SPA (Sense plan act) architecture drawbacks for robotics. 6
 - b) Explain detailed diagram DAMN architecture. 6
 - c) Explain Modularity in context of designing and developing Robot 6
 - d) Briefly describe how stereo cameras can be used to extract depth information from images 6
- Q.4 Attempt **any two** of the following (12)
- a) State and explain Depth first search algorithm. 6
 - b) Explain simulated annealing of hill climbing algorithm with example 6
 - c) Compute the space and time complexity of A* algorithm 6
 - d) State and explain the different types state space search. 6
- Q.5 Attempt **any two** of the following (12)
- a) Define Robotics and Robots 6
 - b) Explain static and dynamic stability with examples 6
 - c) Discuss Generate and test samples. 6
 - d) Explain behavior based control in details? 6