**Q.P. Code: 29399**

**(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) What are indicator random variables? Give analysis of the hiring problem using indicator random variables. **6**

b) Explain various asymptotic notations and functions with examples. **6**

c) Describe the running time of the recursive FIND-MAXIMUM-SUBARRAY procedure. **6**

d) Explain analysis of insertion sort. Discuss worst-case and average-case analysis of it. **6**

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

a) Explain the Rod cutting problem. Thus, solve the following problem to cut a 10 meter rod and show how to earn maximum profit. **6**

| Size | 1 | 2 | 3 | 5 | 6 | 8 | 10 |
|---|---|---|---|---|---|---|---|
| Unit Price | 1 | 2 | 4 | 8 | 10 | 15 | 16 |

b) Define longest-common-subsequence problem. Give algorithm to solve this problem. **6**

c) Explain the execution of Prim's algorithm on any suitable graph. Why Prim's algorithm is a special case of the generic minimum-spanning- tree method? **6**

d) What is Dynamic programming? How Greedy algorithms are different than Dynamic programming? **6**

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

a) What are finite groups in modular arithmetic? Give example. **6**

b) Give overview of showing problems to be NP-complete. **6**

c) Solve following modular linear equation **6**

$14x \equiv 30 \pmod{100}$

d) Give a greedy approximation algorithm to solve the set-covering problem. **6**

[TURN OVER…

| | | |
|---|---|---|
| Q.4 | Attempt **any two** of the following. | **(12)** |
| a) | Explain different research ethics to be followed by every researcher. | **6** |
| b) | What is the methodology of a research? Give example. | **6** |
| c) | What is purpose of writing a literature review in a thesis? | **6** |
| d) | What is data in research? Why data need to be analyzed? | **6** |

| | | |
|---|---|---|
| Q.5 | Attempt **any two** of the following. | **(12)** |
| a) | Explain Matrix-chain multiplication problem. Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is (5, 10, 3, 12, 5, 50, 6). | **6** |
| b) | What is a minimum spanning tree? Consider following connected graph. Determine minimum spanning tree in it.  | **6** |
| c) | What is purpose of Chinese remainder theorem? State any two major applications of it. | **6** |
| d) | What different research mythologies are used in research? | **6** |

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**(2 ½ Hours)** **[Total Marks: 60]**

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

**a)** Explain Internet Protocol stack. **6**
**b)** Write a short note on transport layer multiplexing and demultiplexing. **6**
**c)** What is the need of a router? Explain its components. **6**
**d)** Write a short note on TCP congestion control. **6**

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

**a)** Explain Data Path Virtualization with Generic Routing Encapsulation. **6**
**b)** What are the different functionalities a modular enterprise must provide to virtualize enterprise network? **6**
**c)** Explain the concept of Control-Plane virtualization. **6**
**d)** Explain Scalability Issues in VLANs **6**

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

**a)** What are the different challenges faced by Mobile Ad-hoc network? **6**
**b)** Explain any one Proactive routing approach. **6**
**c)** Explain the need of Wireless PAN. **6**
**d)** Write a short note on Piconet and Scatternet. **6**

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

**a)** What is Clustering of Sensing Networks? **6**
**b)** Write a short note on Randomly Distributed Sensors. **6**
**c)** Write a note on RFID. **6**
**d)** What are advantages and disadvantages of Wireless Sensor Network? **6**

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

**a)** Write a note on Hierarchical Routing Algorithm **6**
**b)** Explain transport virtualization. **6**
**c)** Write a short note on Bluetooth Specification. **6**
**d)** Write a short note on Regularly Placed Sensors. **6**

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# Code No:29816

**(2 ½ Hours)** **[Total Marks: 60]**

**N. B.**: (1) **All questions** are **compulsory**
(2) **Figures** to the **right** indicate **full marks**.

**1.** Attempt any ***two*** of the following: **[12]**

**(a)** Define Distributed Management System. State the types of distributed management system. **[06]**

**(b)** Define Replication. State the advantages and disadvantages of Replication. State the Rule of creating replications of fragments in the distributed database system. **[06]**

**(c)** State the importance of query optimization. State different issues that are faced by query optimizer while processing query in distributed database. **[06]**

**(d)** What is Fragmentation? State the rules of correct fragmentation. **[06]**

**2.** Attempt any ***two*** of the following: **[12]**

**(a)** Assume that the data are distributed across 5 sites A to E. Item *a* is stored at site A, item *b* is stored at site B and so on. $R_i(a)$ and $W_i(a)$ denote read and write lock request by transaction *i* on data item *a*. Consider the following sequence of operations: **[06]**

$W_1(c), R_5(b), R_4(a), W_3(d), R_4(e), R_2(a), W_3(b), W_6(e), R_5(a), W_7(a), R_6(c), W_6(b), W_8(a), W_2(b), R_4(d), W_1(e)$

Draw the wait-for graph (WFG) for the above operations. Identify deadlocks if there is any.

**(b)** What is three phase commit protocol? Explain how it is different from two phase commit Protocol? **[06]**

**(c)** What is a Transaction? State and explain the properties of Transaction. Explain any one property with appropriate example. **[06]**

**(d)** Explain Parallel Query Evaluation with referenced to the following aspects: **[06]**

i) Speed up
ii) Scale up

**3.** Attempt any ***two*** of the following: **[12]**

**(a)** Describe in detail the Object Oriented Database with the help of following points: **[06]**

i) Object Identity

ii) Object Structure

**(b)** Explain in brief the difference between temporal database and non-temporal database. Give proper illustration. **[06]**

**(c)** What is the difference between persistent and transient objects? **[06]**

**(d)** What is R-tree? State the characteristics of R-Tree. Describe R-tree with suitable example. **[06]**

**4.** Attempt any ***two*** of the following: **[12]**

**(a)** What do you mean by safe datalog program? Illustrate with appropriate example. **[06]**

**(b)** Write a short note on: Clause Form and Horn Clause. **[06]**

**(c)** Define Active Database. State how it is different than passive database. **[06]**

**(d)** Describe how XML data can be stored in a relational database? Illustrate with example. **[06]**

**5.** Attempt any ***two*** of the following: **[12]**

**(a)** Briefly explain the various design strategy of distributed database. **[06]**

**(b)** Explain following the concepts: **[06]**

a. Unstructured Complex Object

b. Structured Complex Object

**(c)** What are the characteristics of spatial data? What are the differences between spatial range queries, nearest neighbor queries and spatial join queries? **[06]**

**(d)** What is the difference between the uses of tags in XML and HTML? **[06]**

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**Q. P. Code : 29507**

**(2 ½ Hours)** **[Total Marks: 60]**

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(5) Use of simple **calculators** and statistical tables are **allowed**.

| | | |
|---|---|---|
| Q.1 | Attempt **any two** of the following | **(12)** |
| a) | Explain with examples the three main categories of robot? | **6** |
| b) | What advantages robot technology offers? | **6** |
| c) | Explain with neat diagram the components of the robot ? | **6** |
| d) | Explain the different types of Motors used in Robots? | **6** |
| Q.2 | Attempt **any two** of the following | **(12)** |
| a) | Explain the importance of COG and polygons of support with respect to a two –legged humanoid and six legged robot on flat ground? | **6** |
| b) | Explain reflectance based shaft encoder mechanism? | **6** |
| c) | Briefly describe how *stereo cameras* can be used to extract depth information from images. | **6** |
| d) | How would you write a controller for a wall following robot using feedback control | **6** |
| Q.3 | Attempt **any two** of the following | **(12)** |
| a) | Explain in detail the drawbacks of the deliberative robot control architectures? | **6** |
| b) | Explain On-Line and Off-Line planning in hybrid control? | **6** |
| c) | What can the robot store and remember to help it navigate a maze? | **6** |
| d) | Explain the concept of optimizing search in a maze? | **6** |
| Q.4 | Attempt **any two** of the following | **(12)** |
| a) | Explain how search operation works in Branch and Bound Algorithm | **6** |
| b) | Explain the following algorithm:<br>Breadth Frist Search to help a robot navigate through a network | **6** |
| c) | Explain Space complexity and time complexity of hill climbing algorithm? | **6** |
| d) | Compute the time and space complexity of A*algorithm? | **6** |
| Q.5 | Attempt **any two** of the following | **(12)** |
| a) | Define Degree of Freedom. Explain degree of freedom with the help of examples | **6** |
| b) | Explain in details position control and torque control in robotics? | **6** |
| c) | Explain how Toto the robot represented the map of its environment | **6** |
| d) | Differentiate between breath first search and depth first search? | **6** |

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