Lb-05

Course Code : CST 311 BPGA/RW - 14/3150

Sixth Semester B. E. (Computer Science and Engineering) Examination

ARTIFICIAL INTELLIGENCE

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry equal marks.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.

1. (a) What are seven characteristics of an AI problem ? What each one of them describes about problem. 4

(b) analyse the missionaries and cannibals problem which is stated as follows. 3 missionaries and 3 cannibals are on one side of the river along with a boat which can hold one or two people. Find a way to get everyone to the other side, without leaving a group of missionaries in one place outnumbered by the cannibals in that place.

(i) Formulate a problem precisely making only those distinctions necessary to ensure a valid solution. Draw a diagram of a complete state space

(ii) Design appropriate search algorithm for it. 4

OR

(c) Give the algorithms for breadth first search and depth first search. Apply BFS to solve water jug problem. 4

(d) What is a production system ? 2

2. (a) "Hill climbing follows greedy local search" Justify. 4

(b) Explain in brief breadth first search with an example. 4

OR

(c) What do you understand by heuristic ? Explain with an example related to searching. 4

(d) Give advantages and disadvantages of depth first search. 2

3. (a) Explain algorithm. 5

OR

(b) Try to solve cryptarithmatic problem

GIVE

FOOD

HAPPY

Upto 3 iterations. 5

(c) What is means ends analysis algorithm ? Give peculiar characteristics. 5

4. Solve any **two** :—

(a) Represent 'uniform of Indian cricket team is blue" in semantic nets. 5

(b) Using resolution answer:" What course would steve like ?"

(1) Steve only likes easy courses.

(2) Science courses are hard.

(3) All the courses in basket weaving department are easy.

(4) BW 301 is a basket weaving course 5

(c) Explain in brief how Baye's theorem can be used for uncertainty handling in AI. 5

5. Solve any **two** :—

(a) Explain in brief decision tree learning. 5

(b) Explain the issues to be addressed while representing knowledge. 5

(c) What is a rule based system ? How can it be used for representing uncertain knowledge ? 5

6. Solve any **two** :—

(a) Explain MYCIN based on following points

(1) Domain.

(2) Knowledge representation.

(3) Inference mechanism. 5

(b) If an expert system needs to be built using fuzzy logic, what minimum stages will be required to build a system ? Explain in brief. 5

(c) With a neat sketch explain components of a typical expert system. 5

4b-5

Course Code : CST 309 BPGA/RW - 14/3149

Sixth Semester B. E. (Computer Science and Engineering) Examination

INTRODUCTION TO WIRELESS COMMUNICATION SYSTEM

[Max. Marks : 60

Time : 3 Hours]

Instructions to Candidates :—

(1) All questions carry equal marks.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) What is the total delay (latency) for a frame of size 5 million bits that is being sent on a link with 10 routers each having a queing time of 2 μs and a processing time of 1 μs. The length of the link is 2000 km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 5 Mbps, which component of the total delay is dominant? Which one is negligible ? 4

(b) A periodic composite signal contains frequencies from 10 to 30 KHz, each with an amplitude of 10 V. Draw the frequency spectrum. 2

(c) Explain the procedure of how a call to a mobile user initiated by a landline subscriber is established. Draw the timing diagram. 4

OR

2. (a) If the signal at the beginning of a cable with 0.3 dB/km has a power of 3 mW, what is the power of the signal at 5 km ? 3

(b) Between a pager a cellular phone and a cordless phone, which device will have the shortest battery life and which will have longest battery life between charging. Justify your answer. 3

(c) Explain the following terms :—

(1) Bandwidth

(2) Baseband Transmission

Contd.

(3) Shonon Capacity

(4) Nyquist Bit rate. 4

3. (a) Describe the following :—

(1) 1G Telephone System.

(2) 2G Phone System.

(3) 2.5G Systems.

(4) 3G Systems. 6

(b) Explain IEEE 802.16 protocol architecture. 4

OR

4. (a) What are the limitations are found in 3G ? 5

(b) Describe the necessities of Wireless Local Loop (WLL). 5

5. (a) A service provider wants to provide cellular communication to a particular geographic area. The total bandwidth the service provider lincensed is 5 MHz and system subscriber requires 10 KHz of bandwidth. Determine the system capacity, if the service provider implements a cellular system with 35 transmitters sites and cluster size of 7.
Also determine frequency reuse distance for a cell radius of 2 km and cluster size is 7. 5

(b) Prove that for a hexagonal geometry, the co–channel reuse ratio is given by $Q = \sqrt{3N}$, Where $N = i^2 + j^2 + ij$. 5

OR

6. (a) Illustrate with neat sketch Handoff scenario at cell boundary. 3

(b) If a signal–to–interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system. What is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (a) n = 4 (b) n = 3 ? Assume that there are six co–channel cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations. 7

7. (a) What are the main benefits of a spread spectrum system? How can spreading be achieved ? Hence explain DSSS and FHSS including schematic view of Transmitter and receivers. 7

(b) The Advanced Mobile Phone System (AMPs) uses two bands. The first band of 824 to 849 MHz is used for sending, and 869 to 894 MHz is used for receiving. Each user has a bandwidth of 30 KHz in each direction. The 3KHz voice modulated using FM, creating 30 KHz of modulated signal. How many people can use their cellular phones simultaneously? 3

OR

8. (a) Determine the maximum throughput that can be achieved using ALOHA and slotted ALOHA protocols. 6

(b) Explain CSMA, (Collision Mechanism in CSMA) and variations of CSMA. 4

9. (a) Discuss block diagram of a cellular system and differentiate between wireless and fixed telephone network. 7

(b) "The MSC is forced to switch calls imperceptibly between base stations throughout the system". Explain why ? 3

OR

10. Describe GSM system architecture and explain what are the different types of services offered by GSM. 10

11. What are the features provided by WTLS ? Discuss its protocol stack with record protocol operation. 10

OR

12. (a) Describe frequency hopping in Bluetooth. 4

(b) Write a WML script to accept user name and password. 6

Course Code : CST 307 BPGA/RW–14/3147

Sixth Semester B. E. (Computer Science and Engineering) Examination

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry equal marks.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) Solve the following recurrence using substitution method :

(i) $T(n) = 2T(n/2) + n$

Assume T(n) is constant for sufficiently small n. Make your bound as tight as possible. 5

(b) Can the master method be applied to the recurrence :

$$T(n) = 4T(n/2) + n^2 \lg n$$

Why or why not ? Give an asymptotic upper bound for this recurrence. 5

OR

2. (a) Draw the recursion tree for $T(n) = 3T(n/2) + cn$ where c is a constant and provide a tight asymptotic bound on its solution. Verify your bound by substitution method. 6

(b) What are the various algorithm design techniques ? Explain in brief. 4

3. (a) What is bitonic sorting network ? Design a 8 bit bitonic sorting network and explain its operation for the following example.

3, 5, 1, 10, 2, 7, 13, 4 6

(b) Define and find upper bound, lower bound and tight bound ranges for following :

(1) $3n^3 + 6n$

(2) $2^{2n} + 3$ 4

OR

4. (a) A sequence of n operations is performed on a data structure. The i^{th} operation costs i if i is an exact power of 2, and 1 otherwise. Use aggregate analysis to determine the amortized cost per operation. 4

(b) Write Algorithm for heap sort. Also explain the working of this algorithm on the following data :

4, 1, 3, 2, 16, 9, 10, 14, 8, 7. 6

5. (a) Write an Algorithm to find minimum and maximum in an array of n integers using divide and conquer method. Also explain the working of this algorithm on the following data :

13, 25, 30, 15, 05, 02, 33, 03, –17, –18

Comment on the time complexity of the Algorithm. 6

(b) Write algorithm for knapsack problem for best case. 4

OR

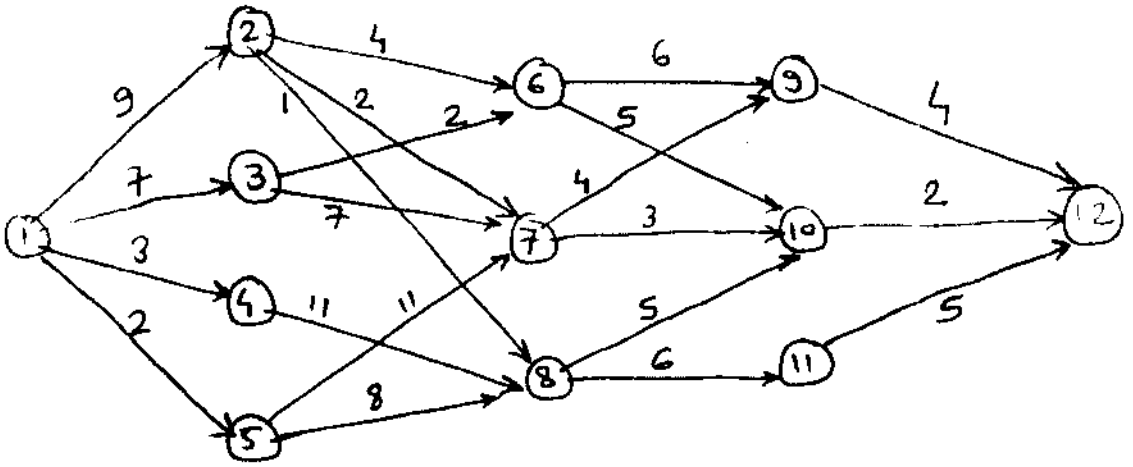
6. (a) Write an Algorithm to find k^{th} smallest and k^{th} largest element in an array of n integers using partition method of Quick sort. Comment on the time complexity of this Algorithm. 5

(b) Give an Algorithm for finding minimum cost spanning tree of a connected graph using Prim's Algorithm. What happens :

(a) In case of Prim's Algorithm.

(b) In case of Kruskal Algorithm, if by mistake we run the Algorithm on a graph that is not connected. 5

7. (a) Find the shortest path from vertex 1 to vertex 12 in the following multistage graph using backward approach. Write Algorithm.



5

(b) Find an optimal parenthesization of a matrix chain product whose sequence of dimensions is

$100 * 1, \quad 1 * 100, \quad 100 * 1, \quad 1 * 100$ 5

OR

8. (a) Propose a suitable algorithm to find and print longest common subsequence for two input strings. Comment on the time complexity of the algorithm. 4

(b) Implement TSP (travelling salesman problem) on the following matrix. Find the cost of path and sequences of vertices :

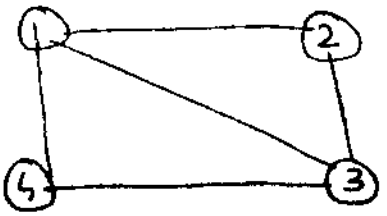
$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$ 6

9. (a) Write Algorithm for finding Hamiltonian cycle in a connected graph, if exist. Also Give an example of it. 6

(b) Write an algorithm to solve 4–queen problem. Explain various constraints used to solve the problem. 4

OR

10. (a) What do you mean by graph coloring problem ? Give an algorithm for this problem. Work out on the following graph using this algorithm when three colors are available.



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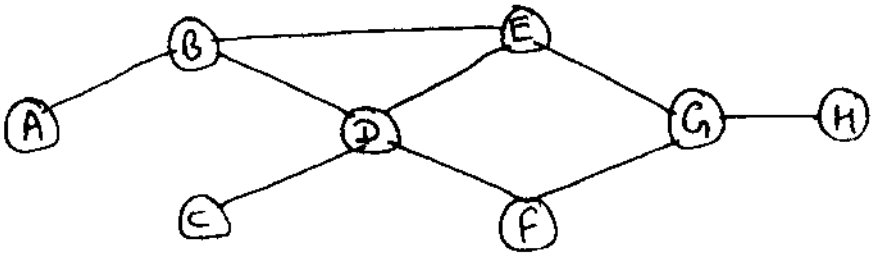
(b) What is articulation point ? Implement the procedure of finding articulation point on the following graph.



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11. (a) What do you mean by Graph partitioned triangle problem in a graph ? Show that this problem is NP complete. 6

(b) Explain the following term with proper example :

(1) NP–hard.

(2) NP problem.

(3) Undecidable problem.

(4) NP–C Problem. 4

OR

12. (a) What do you mean by polynomial reduction ? Explain with an example. How it is used to find the class of any algorithm ? 6

(b) What do you mean by clique problem in a graph ? Prove that this problem is NP–Complete. 4

Hb-05

Course Code : CST 308 BPGA/RW - 14/3148

Sixth Semester B. E. (Computer Science and Engineering) Examination

DATABASE MANAGEMENT SYSTEM

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry equal marks.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) What is logical data independence and why is it important ? Give a practical example why logical data independence is important. 3

(b) Consider the following database and give expression in SQL.

Employee (eno, DOB, Address, gender, salary, Name, DNo);

Department (DNo, Dname, mgr)

Dept–location (Dno, Dlocation)

Project (Pname, Pno, plocation, Dno)

Works–on (eno, Pno, hrs)

Dependent (eno, dep–name, gender, bdate, relationship)

(a) Retrieve the names of all employes in department 5.

(b) List the names of all employees who have no dependents.

(c) Retrieve the names of all employees who do not work on any project.

(d) Retrieve the average salary of all female employees. 4

(c) Write PL/SQL block to find greatest of three Nos. 3

OR

2. (a) Consider the following databases and give expression in Relational Algebra.
Restaurants (rid, mame. rcity, phone, seat-capacity)
Dishes (did. dname. dtype)
Customer (cid, cname. ccity)
Serves (rid, did)
Has–auergy (cid, did)

(a) Find the names of the restaurants that serve "Burger" (dishname)

(b) Find all restqurants in Nagpur and specifically give their names and phone numbers.

(c) List the name of dishes that appear in all restaurant in New Delhi.

(d) Find the names of customers who are allergic to "Palak Paneer" (dish name)

(e) Print the menu of restqurant "Taj". 5

(b) Describe the three–schema architecture. Why do we need mappings between schema level ? 5

3. (a) Define Boyce-Codd Normal form (BCNf). How does it differ from 3NF? Why is it considered a stronger from 3NF ? Provides an example to illustrate. 5

(b) Following relation is given :
STUDENT (COURSE, SNAME, FACULTY, TERM, GRADE)
Each student receives only one grade in a course during a terminal examination. A student can take many courses and each course can have more than one faculty in a terminal.

(a) Define the fDs and MVDs in this relation.

(b) Is the relation in 4Nf ? If not decompose the relation. 5

OR

4. (a) Explain how dangling tuples may arise. Explain problems that they may cause. 4

(b) Compute canonical cover Fc for the $R = \{A, B, C, D\}$ and $FDs = \{A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C, AC \rightarrow D\}$ 6

5. (a) Construct a B^+ – tree for the following set of Values : (2, 3, 5, 7, 11, 17, 19, 23, 29, 31). Assume that the tree is initially empty and values are added in ascending order. Construct B^+, tree for the cases where the number of pointers that will fit in one node is as follows :—

a. Four

b. Six

c. Eight

For each of the constructed B^+–Tree perform the following series of operation.

a. Insert 9

b. Insert 10

c. Delete 23 6

(b) When is it preferable to use a dense index rather than a sparse index ? Explain your answer. Is it possible in general to have two primary indexes on the same relation for different search keys ? Explain your answer. 4

OR

6. (a) What are the causes of bucket overflow in a hash file organization ? What can be done to reduce the occurrence of bucket overflows ? 4

(b) Suppose that we are using extenduble hashing on a file that contains records with the following search key values.
2, 3, 5, 7, 11, 17, 19, 23, 29, 31.
Show the extendable hash structure for this file if the hash function is $h(x) = x \bmod 8$ and buckets can hold three records. 6

7. (a) Let relations $r_1(A, B, C)$ and $r_2(C, D, E)$ have the following properties : r_1 has 20,000 typles, r_2 has 45,000 typles, 25 typles of r_1 fit on one block, and 30 typles of r_2 fit on one block. Estimate the number of

block accesses required using each of the following join strategies for $r_1 \times r_2$.

a. Nested-loop join

b. Block nested-loop join

c. Merge join

d. Hash join 5

(b) Why is it not desirable to force users to make an explicit choice of a query-processing strategy ? Are there cases in which it is desirable for users to be aware of the cost of competing query-processing strategies ? Explain your answer. 5

OR

8. (a) Explain cost-Based and Heuristic optimization with example. 5

(b) Consider the relations $r_1(A, B, C)$, $r_2(C, D, E)$ and $r_3(E, F)$ with primary keys A, C and E respectively. Assume that r_1 has 1000 typles, r_2 has 1500 tuples and r_3 has 750 tuples. Estimate the size of $r_1 \bowtie r_2 \bowtie r_3$, and give an efficient strategy for computing the join. 5

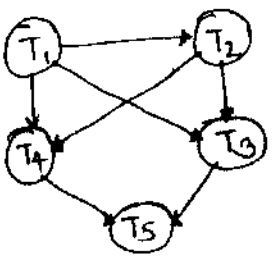
9. (a) Most implementations of database systems use strict two phase locking. Suggest three reasons for the popularity of this protocol. 4

(b) Show that the two-phase locking protocol ensures conflict serializability and the transactions can be serialized according to their lock points. 6

OR

10. (a) List the ACID properties. Explain the usefulness of each. 4

(b) Consider the precedence graph given below. Is the corresponding schedule conflict serializable ? Explain.



6

11. (a) Explain ARIES algorithm for recovery. 5

(b) Explain Log–Based recovery with example. 5

OR

12. (a) Explain the Role of operating system in Buffer management. 5

(b) Compare the shadow–paging recovery scheme with the log-based recovery schemes in terms of ease of implementation and overhead cost. 5