NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
(An Institution of National Importance)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Minor I, Feb' 2019
II MCA – II SEMESTER
Algorithm Analysis and Design –CS6351

Date: 15th Feb' 2019. ***Max. Marks:*** *10* **Time:** 4:00 pm – 5:00 pm.

Q	*Answer all the following questions*	Mar
1.	Two packages A & B are available for processing a database having 10^k $(k\geq 1)$ records. Package A takes a time of $0.0001n^2$ units and package B takes a time of $10n\log_{10} n$ units for processing n records. What is the smallest value of 'k' for which package B is preferred over package A? a) 5 b) 6 c) 10 d) 15	1
2.	Let $T(n)$ be the function for $T(1)=1$, $T(n)=3T(n-1)+1$, $n\geq 2$ evaluates to a) $\Theta(2^n)$ b) $\Theta(n^2)$ c) $\Theta(3^n)$ d) $\Theta(n^3)$	1
3.	Arrange the following functions in the increasing order of asymptotic complexities. $f_1(n)=n^{1/3}$, $f_2(n)=(2.718)^n$, $f_3(n)=n^{7/4}$, $f_4(n)=n\log^2 n$, $f_5(n)=(1.001)^n$	1

4.	Determine the complexity of following program segment and represent in Θ notation
	i=1, k=1;
	while(k<=n) → n
	{
	++i;
	k=k+i;
	}
		1

5.	Solve the following recurrence relation using back substitution method. $T(1)=1$, $T(n)=3T(n/2)+n^k$, for $n\geq 2$	2
6.	Give a $\Theta(n \lg n)$ time algorithm for determining if there exist two elements in a set S whose sum is exactly some value x.	2
7.	Sort the list of the elements 10,5,7,6,1,4,8,3,2,9 using merge sort algorithm and derive its time complexity.	2

$\log_b a > k$ $n^{\log_b a}$

$\log_3 2 < k$

$p=0$

$p2=0$

$\frac{\log 2}{\log 3}$

$\frac{1}{1.5}$

$8 \log n$

14352

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NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MCA, IV Semester

Model Minor Examination, Feb 2019

Sub : Machine Learning

Date: 21-02-2019

Time : 50 Minutes

Max. Marks: 10

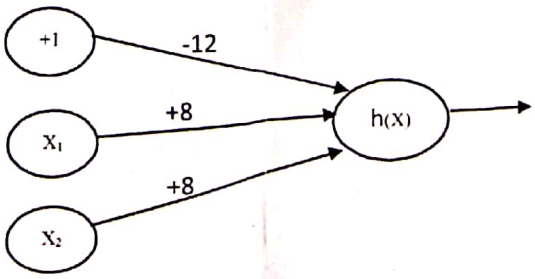
1. Which of the following is true?
(i) On average, neural networks have higher computational rates than conventional computers.
(ii) Neural networks learn by example.
(iii) Neural networks mimic the way the human brain works.
(a) all of them are true
(b) (ii) and (iii) are true
(c) (i), (ii) and (iii) are ~~true~~ not true
(d) (i) and (iii)

2. The back-propagation learning algorithm applied to a two-layer neural network
A) always finds the globally optimal solution,
S) finds a locally optimal solution which may be globally optimal.
C) never finds the globally optimal solution.
D) finds a locally optimal solution which is never globally optimal

3. In a neural network, which one of the following techniques is NOT useful to reduce overfitting?
A) Dropout
B) Regularization
C) Batch normalization
D) Adding more layers

4. For an image recognition problem (such as recognizing a cat in a photo), which architecture of neural network has been found to be better suited for the tasks?
A) Multi-layer perceptron
B) Recurrent neural network
C) Convolutional neural network
D) Perceptron

5. The neural network given below takes two binary valued inputs x.. x2 ∈{0, 1} and the activation function is the binary threshold function *{h(x)=1 if x>0; 0 otherwise}*. Which of the following logical functions does it compute?



0 0
0 1
1 0
0 0

8-12

12-16 (4)

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NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
MINOR EXAMINATION, 21st FEB 2019
MCA- IV Sem
CS6352 – Computer Communications and Networking

Time: 1 hour | Max. Marks: 10

Answer ALL questions:

1. Discuss the parameters for effective data communication [2]
2. Differentiate OSI and TCP/IP protocol layers. List the supporting protocols in each layer with sketch. [2]
3. Derive the bit pattern transmitted for the message 1101001100110101 to detect and correct single bit errors using Hamming code (Assume even parity). [2]
4. What is Bit Stuffing? Bit Stuff the following frame: 00011111000011111010001111110111110000111. [2]
5. Discuss the Checksum method for error control. [2]

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NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MCA, II Year II-Semester

Minor-2 Examination, April 2019

Sub : Machine Learning | Date: 26-04-2019

Time : 30 Minutes | Max. Marks: 10

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1. Consider a binary classification problem. Suppose I have trained a model on a linearly separable training set, and now I get a new labeled data point which is correctly classified by the model, and far away from the decision boundary. If I now add this new point to my earlier training set and re-train, in which cases is the learnt decision boundary likely to change? [1M]
(a) When my model is a perceptron.
(b) When my model is logistic regression.
(c) When my model is an SVM.
(d) When my model is decision tree

2. The k-means algorithm for clustering is guaranteed to converge to a local optimum. [1M]

A) True B) False

3. The singular value decomposition of a real matrix is unique. [1M]

A) True B) False

4. Assume we use radial basis kernel function. Thus there is some implicit unknown mapping function $\Phi(x)$. Prove that for any two input instances x_i and x_j, the squared Euclidean distance of their corresponding points in the feature space Q is less than 2. [2M]

5. Explain about expectation and maximization algorithm with equations [2M]

6. You are given the following five training instances [2M]

1. x1 = 2; x2 = 1; y = 4
2. x1 = 6; x2 = 3; y = 2
3. x1 = 2; x2 = 5; y = 2
4. x1 = 6; x2 = 7; y = 3
5. x1 = 10; x2 = 7; y = 3

We want to model this function using the K-nearest neighbor model. When we want to predict the value of y corresponding to (x1; x2) = (3; 6)
(a) For K = 2; y = 3
(b) For K = 2; y = 2:5
(c) For K = 3; y = 2:33
(d) For K = 3; y = 2:666

7. Explain about Soft margin in SVM [1M]

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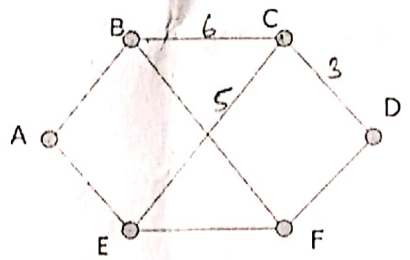
NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
MINOR EXAMINATION, 23rd April 2019
MCA- IV Sem
CS6352 – Computer Communications and Networking

Time: 1 hour | Max. Marks: 10

Answer ALL questions:

1. A large number of consecutive IP addresses are available starting at 198.16.0.0. Suppose that four organizations A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, compute the first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/s notation. [3]
2. An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows.
   a. The first group has 200 medium-size businesses; each needs 128 addresses.
   b. The second group has 400 small businesses; each needs 16 addresses.
   c. The third group has 2000 households; each needs 4 addresses.

   Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations. [4]
3. Design the routing table for router C using distance vector routing for the following subnet. Let the following vectors have just come into router C: from B: (5, 0, 8, 12, 6, 2); from D: (16, 12, 6, 0, 9, 10); and from E: (7, 6, 3, 9, 0, 4). The measured delays to B, D, and E, are 6, 3, and 5 respectively. [2]



4. The size of the option field of an IPv4 datagram is 20 bytes. What is the value of HLEN? What is the value in binary? [1]

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NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
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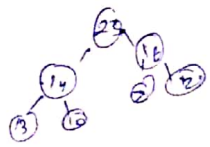
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Minor II, Apr' 2019
II MCA – II SEMESTER
Algorithm Analysis and Design –CS6351

Date: 12th Apr' 2019. **Time:** 5:00 pm – 6:00 pm.

Q	*Answer all the following questions*	M
1.	In a binary max heap containing n numbers, the *smallest* element can be found in time a) O(n) b) O(logn) c) O(loglogn) d) O(1)	.5
2.	Consider a binary max-heap implemented using an array. Which one of the following array represents a binary max-heap? a) 25,12,16,13,10,8,14 b) 25,14,16,13,10,8,12 c) 25,14,12,13,10,8,16	.5
3.	What is the time complexity of *build heap* operation? Build heap is used to build a max (or min) binary heap from a given array. a) O (nlogn) b) O (n^2) c) O (logn) d) O (n)	.5
4.	Given a pattern of length- 5 window, find the *spurious hit* in the given text string. Pattern: 3 1 4 1 5 Modulus: 13 Index: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Text: 2 3 5 9 0 2 3 1 4 1 5 2 6 7 3 9 9 2 1 3 9 a) 6-10 b) 12-16 c) 3-7 d) 13-17	.5
5.	Find an optimal *parenthesization* of a matrix-chain product whose sequence of dimensions is 5, 10, 3, 12, 5, 50, 6.	1.5
6.	A sequence is a palindrome if it reads the same whether we read left to right or right to left. For example A,C,G,G,G,G,C,A. Given a sequence of length n devise an algorithm to output length of the longest palindrome subsequence. For example, the string, A,G,C,T,C,B,M,A,A,C,T,G,G,A,M has many palindromes as subsequences, for instance: A,G,T,C,M,C,T,G,A has length 9.	3
7.	Sort the given list of numbers using *heap sort*: 2, 9, 7, 6, 5, 8.	1.5
8.	Two string x and y are rotations of each other if there exists strings u and v such that x = uv and y=vu. For example *abcde* and *deabc* are rotations of each other. Devise a linear time algorithm for determining whether given two strings are rotations of each other. (Hint: use a linear time exact string matching algorithm.)	2

$m(i,j) = \min\{c_{ik} + g(k, j-1-k)\}$



geeks for geeks

A_1	A_2	A_3	A_4	A_5	A_6
5×10	10×3	3×12	12×5	5×50	50×6

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NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

Re-MID Examination, March 2019

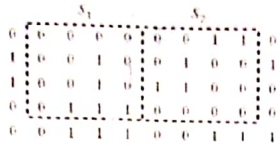
Sub : Image Processing

Time : 2 Hrs.

Date: 27-03-2019

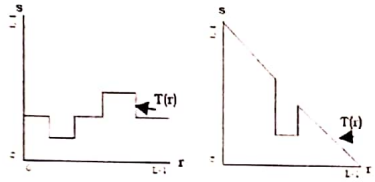
Max. Marks: 30

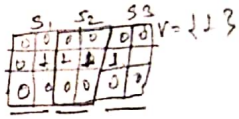
1 (a) Consider the two image subsets S1 and S2, shown in the following figure. For V = {0}, determine whether these two subsets are (a) 4-adjacent, (b) 8-adjacent, or (c) m-adjacent. 6M



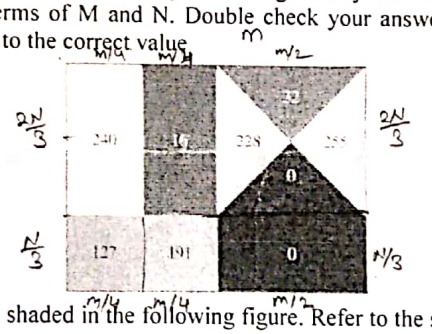
(b) Consider the three image segments S1, S2 and S3. If S1 is m-adjacent to S2 and S2 is m-adjacent to S3. Can we say S1 is m-adjacent to S3? Justify, with an example.

2 What is the difference between the following two types of Intensity-level slicing. What is the type of the images (gray/binary/...) produced by these slicing. What changes we see in the resultant images? 6M



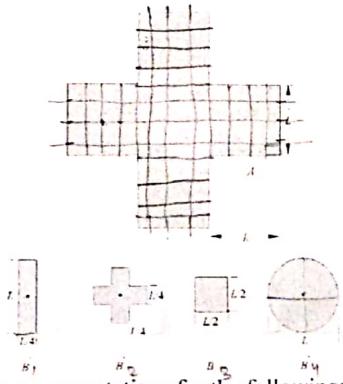


3 Obtain the un-normalized and the normalized histograms of the following 8-bit, M×N image. Give your histogram either in a table or a graph, labeling clearly the value and location of each histogram component in terms of M and N. Double check your answer by making sure that the histogram components add to the correct value. 6M



4 Let A denote the set shown shaded in the following figure. Refer to the structuring elements shown (the black dots denote the origin). Sketch the result of the following morphological operations: 6M

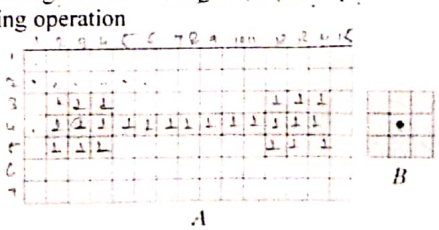
(i) (AθB4)⊕B2 (ii) (AθB1)⊕B3.



5 Show all intermediate steps of your computations for the following: 6M

(a)Obtain the opening of the figure below using a 3×3 SE of 1s. Do all operations manually.

(b) Repeat (a) for the closing operation



$A \circ B = (A \ominus B) \oplus B$

$A \bullet B = (A \oplus B) \ominus B$

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Department of Computer Science and Engineering
National Institute of Technology, Warangal
II/III M.C.A Re-Mid Semester Examination, March 2019

SOFTWARE ARCHITECTURE

Time:2 Hours | Answer all the following | Marks:30

1. How architectures are Influenced by system stake holders. 5
2. How architectures are influenced by the background and experience of the architects. Discuss in detail. 5
3. Explain about architectural patterns, reference models and reference architectures. 5
4. How architecture is used as a transferable and reusable model. 5
5. Explain some of the most common and useful software's structures like module, component-and -connector and allocation. 5
6. Explain about the process and product recommendations in detail. 5

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NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MCA, II Year II-Semester

Re-Mid Examination, March 2019

Sub : Machine Learning — Date: 28-03-2019

Time : 2 Hours — Max. Marks: 30

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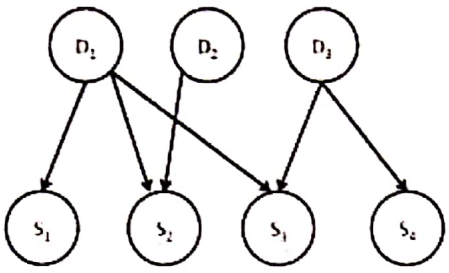
1. Write down the expression for the joint probability distribution as a product of conditional probabilities of given below Bayesian network [3M]



2. Suppose you are given the following two-dimensional dataset for a binary classification task:

x_0	X_1	X_2	t
1	0	0	1
1	1	1	1
1	1	0	0

$1 \geq 0$

$0 < 0$

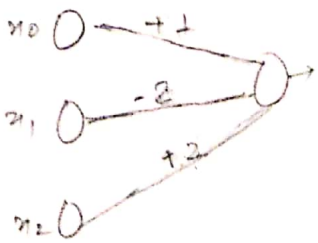
You use a linear model with a hard threshold activation function, and a dummy dimension x_0 so that w0 functions as a bias. You would like to find a weight vector in the strictly feasible region, i.e. none of the training examples should lie on the decision boundary.

a. Each of the training examples gives a constraint on w_0, w_1, and w_2. Write down all three constraints. [3M]

b. Find a set of weights which satisfies all the constraints. You do not need to show your work or justify your answer. Hint: pick w0 first, then w1, then w2 [3M]

3. design a multilayer perceptron which receives three binary-valued (i.e. 0 or 1) inputs x_1; x_2; x_3, and outputs 1 if exactly two of the inputs are 1, and outputs 0 otherwise. All of the units use a hard threshold activation function: $Z = \begin{cases} 1 & if\ z \geq 0 \\ 0 & if\ z < 0 \end{cases}$ $\quad Z = \begin{cases} 1 & if\ z \geq 0 \\ 0 & if\ z < 0 \end{cases}$

$x_1 \quad x_2 \quad x_3$



$-1+0+2=0$

$1+1+0$

$=0$

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Specify weights and biases which correctly implement this function. You do not need to explain your solution. Hint: one of the hidden units should activate if 2 or more inputs are on, and the other should activate if all of the inputs are on. [5M]

4. In an oral exam you have to solve exactly one problem, which might be one of three types, A, B, or C, which will come up with probabilities 20%, 50%, and 30%, respectively. During your preparation you have solved 9 of 10 problems of type A, 2 of 10 problems of type B, and 6 of 10 problems of type C. [5M]

1. What is the probability that you will solve the problem of the exam? 0.460
2. Given you have solved the problem, what is the probability that it was of type C? $\frac{6/10}{5}$ 0.39

5. Suppose we are given the following dataset, where A, B, C are the binary input random variables and Y is the binary output whose value we want to predict. [8M]

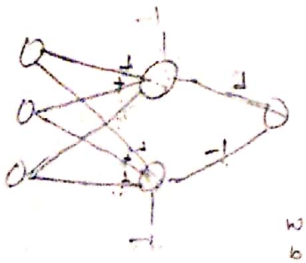
A	B	C	y
0	0	1	0
0	1	0	0
1	1	0	0
0	0	1	1
1	1	1	1
1	0	0	1
1	1	0	1

0 0 1 0
0 1 0 0
1 1 0 0
0 0 1 1
1 1 1 1
1 0 0 1
1 1 0 1

a) How would a naïve Baye's classifier predict Y for the given input A=0, B=0 and C=1. One can assume that in case of a tie the classifier always prefers to predict 0 for Y.
b) Suppose you know for sure that A, B and C are independent random variables. In this case is it possible for any other classifier (for example a decision tree or a neural net) to do better than naïve Bayes classifier?

6. Given a list of 14 examples including 9 positive and 5 negative examples. The entropy of the dataset with respect to this classification is. [3M]

0.940283



x_1	x_2	x_3	t
0	0	0	0
0	0	1	0
0	0	0	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

$z = \sum_{0}^{1}$ $z \geq 0$ $z < 0$

$0.46 \times \frac{30}{10}$

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NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
MID EXAMINATION, 26th FEB 2019
MCA- IV Sem
CS6352 – Computer Communications and Networking

Time: 2 hour | Max. Marks: 30

Answer ALL questions:

1. A bit pattern 10011101 is to be transmitted using the CRC method and the generator polynomial is x^3+1. What is the actual bit string transmitted? Suppose the third and fifth bit from the left are inverted during transmission. Can this errors will be detected. Explain. [5]

2. Let for a reliable Stop-and-Wait protocol, the frame size is 1000 bytes and the transmission rate at the sender is 80 Kbps (1Kbps = 1000 bits/second). Size of an acknowledgement is 100 bytes and the transmission rate at the receiver is 8 Kbps. The propagation delay (one-way) is 100 milliseconds. [5]

   a. Compute the total elapsed time for a frame to complete its transmission (i.e., frame transmission time + propagation delay in the network + Acknowledgement time).
   b. Compute the sender throughput (i.e., number of bytes sent/second).

3.
   a. Discuss the Go-Back *N* ARQ protocol with neat sketch. [5]
   b. Prove (with an example) that the size of the sender and receiver window in selective repeat ARQ protocol must be at most 2^m, where m is the number of bits to represent the sequence number. [3]

4. Discuss the Reservation (Bit Map) and Binary Countdown protocols for MAC. [5]

5. Sketch the Manchester and Differential Manchester encoding for the bit stream: 0001110101 [3]

6. Discuss the Token Ring MAC protocol frame structure and explain how it provides priorities. [4]

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NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
MID SEMESTER EXAMINATIONS – FEB'/MAR' 2019
II MCA – II SEMESTER
ALGORITHM ANALYSIS AND DESIGN – CS6351

Date: 25th Feb' 2019. ***Max. Marks:*** *30* **Time:** 2:30 pm – 4:30 pm.

Q *Answer all the following questions* Marl

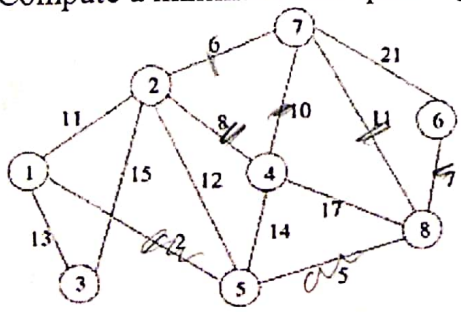
1. Solve the following recurrence relations using substitution method. 4
   a) T (1) = 1, T (2) = 6, T (n) = T (n-2) + 3n + 4 for all n ≥ 3.
   b) T (1) = 1, T (n) = 2T (n/2) + 6 n - 1 for all n≥2.

2. There is an iterative algorithm for finding the maximum and minimum which, though not a divide-and-conquer-based algorithm, is probably more efficient than *MaxMin* (discussed in the class). It works by comparing consecutive pairs of elements and then comparing the larger one with the current maximum and the smaller one with the current minimum. Write the algorithm completely and analyze the number of comparisons it requires. 3

3. a) Show how quicksort sorts the following sequence of keys: 10,10,10,10, 10, 10, 10 and compute the running time of quicksort using substitution method when all elements of array *A* have the same value. 4
   b) Write the insertion sort algorithm to sort into non increasing instead of non decreasing order with an example. 3
   c) Write an algorithm to determine the Kth-smallest element from the given n elements of the array a[1 : n] using divide and conquer method and compute its time complexity. 3

4. a) State the Greedy Knapsack? Find an optimal solution to the Knapsack instance n=3, m=20, (P1, P2, P3) = (25, 24, 15) and (W1, W2, W3) = (18, 15, 10). 3
   b) Draw the frequency table and Huffman tree for the following string and write the Huffman code for each character. 2
   cats cannot catch rats

5. a) Compute a minimum cost spanning tree for the following graph using Prim's algorithm. 2



   b) Write Prim's algorithm and analyze precisely the computing time and space requirements of Prim's algorithm. 3
   c) Give an example of a weighted directed graph, *G*, with negative-weight edges, but no negative-weight cycle, such that Dijkstra's algorithm incorrectly computes the shortest-path distances from some start vertex *v*. 3

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NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MCA, II Year II-Semester

Mid Examination, February 2019

Sub : Machine Learning

Date: 01-03-2019

Time : 2 Hours

Max. Marks: 30

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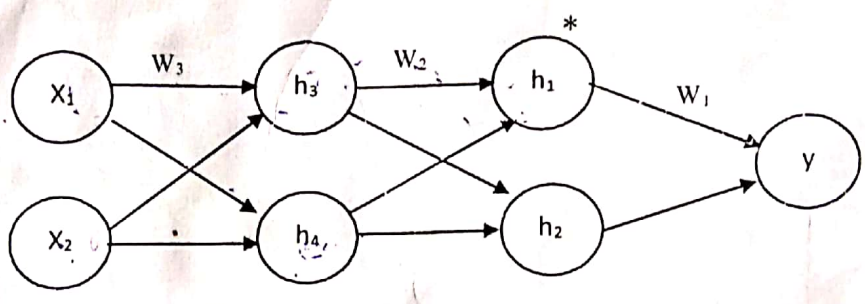
1. Consider the network shown in the figure. All of the hidden units use the linear rectification non linearity $h_i = max(z_i, 0)$. We are trying to minimize a cost function C which depends only on the activation of the output unit y. The unit h_1 (marked with a*) receives an input of -1 on a particular training case, so its output is 0. Based only on this information, which of the following weight derivatives are guaranteed to be 0 for this training case? Write YES or NO for each. Justify your answers informally. Hint: don't work through the backprop computations. [4M]



2. Answer the following questions

a) Consider the factorized joint probability

$$P(A,B,C,D,E,F,G) = P(G|E)P(E|B)P(F|C,D)P(C)P(D|A,B)P(B)P(A)$$

Draw the corresponding Bayesian network. [3M]

b) A drug test (random variable T) has 1% false positives (i.e., 1% of those not taking drugs show positive in the test), and 5% false negatives (i.e., 5% of those taking drugs test negative). Suppose that 2% of those tested are taking drugs. Determine the probability that somebody who tests positive is actually taking drugs (random variable D). [4M]

c) In an oral exam you have to solve exactly one problem, which might be one of three types, A, B, or C, which will come up with probabilities 30%, 20%, and 50%, respectively. During your preparation you have solved 9 of 10 problems of type A, 2 of 10 problems of type B, and 6 of 10 problems of type C. [5M]

(i) What is the probability that you will solve the problem of the exam?

(ii) Given you have solved the problem, what is the probability that it was of type A?

3. Answer the following questions

a) A binary linear classifier to compute the NAND (not-AND) function. This function receives two binary-valued inputs x_1 and x_2, and returns 0 if both inputs are 1, and returns

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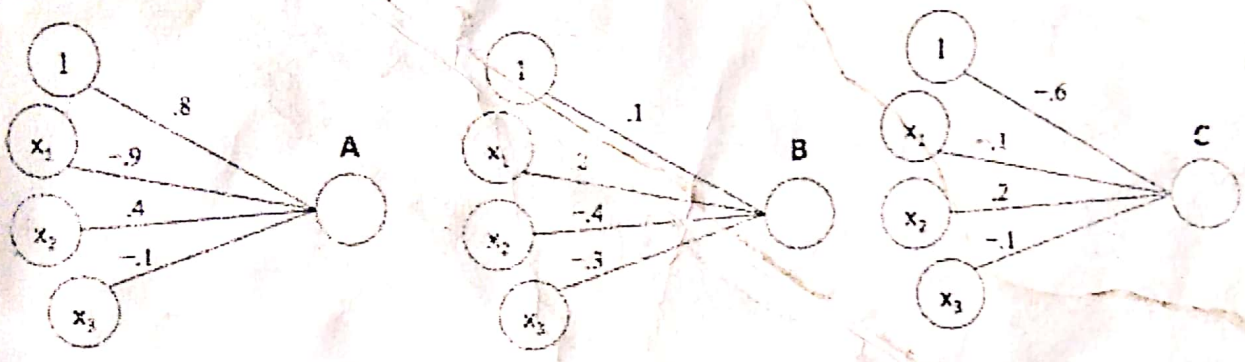
1 otherwise. Give four constraints on the weights w_1 and w_2 and the bias b, i.e. one constraint for each of the 4 possible input configurations. [3M]

b) Consider the three perceptron's below, which respectively correspond to classes A, B, and C. For a given input x, the perceptron with the highest value of $\sum_i w_i x_i$ is the prediction of the group. [3M]



If x = (1, 1, 0) is the input to this group, which class is the prediction of the group?

4. Build a decision tree from the given tennis data set. You should build a tree to predict Play Tennis, based on the other attributes (but, do not use the Day attribute in your tree). Show all of your work, calculations, and decisions as you build the tree. What is the classification accuracy? [8M]

Day	Outlook	Temperature	Humidity	Wind	PlayTennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

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NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
(An Institution of National Importance)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
End Sem Examinations - May' 2019
II MCA – II SEMESTER
Algorithm Analysis and Design –CS6351

Date: 6th May' 2019. ***Max. Marks:*** *50* **Time:** 2:30 pm – 5:30 pm.

Q Answer all the following questions. M

PART – I

1. Given a sequence of n numbers, the *distinct elements problem* is to check if there are equal numbers. Give an O(1) time nondeterministic algorithm for this problem. 2

2. Define CNF-satisfiability (CNF-SAT) and clique decision problem (CDP). Show that CDP is NP-hard by transforming from CNF-SAT. Also show that CDP is NP-complete. 8

3. State the *sum of subsets problem*. Design a backtracking algorithm for the sum of subsets problem using the state space tree corresponding to the variable tuple size formulation and analyze its time complexity. Draw the portion of the state space tree that is generated for w = {5, 7, 10, 12, 15, 18, 20}, m=35 and find all possible subsets of w that sum to m. 7

4. What is the *chromatic number* of a graph? Design an algorithm for finding all *m-colorings* of a graph using backtracking and analyze its time complexity. Also draw the state space tree for m= 3colors n=4 vertices of the following graph. 6

5. Define *principle of optimality*. List out two problems for which the principle of optimality does not hold. Explain why the principle of optimality does not hold for these problems. 3

6. Apply Floyd Warshall algorithm to the graph whose adjacency matrix is given below to compute the lengths of shortest paths between all pairs of nodes. 3

$$\begin{bmatrix} 0 & 6 & 13 \\ 8 & 0 & 4 \\ 5 & \infty & 0 \end{bmatrix}$$

7. Solve the following recurrence relation using substitution method 3

$$T(n) = \begin{cases} 1 & n=1 \\ aT(n/b)+f(n) & n>1 \end{cases}$$ where a=5, b=4, and $f(n) = cn^2$.

8. State the *job sequencing with deadlines* problem. Find an optimal sequence to the n=5 jobs where profits $(P_1,P_2,P_3,P_4,P_5) = (20,15,10,5,1)$ and deadlines $(d_1,d_2,d_3,d_4,d_5) = (2,2,1,3,3)$. 3

P.T.O

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PART - II

1. Let the A and B are two sorted arrays. Array A is of size $m+n$ containing only m elements. Array B is of size n and contains n elements. Write a function to merge these two arrays into the array A of size $m+n$ such that the output is sorted. 3

2. Given a string, write a function for recursively removing the adjacent characters if they are same. For example, abccbcba → abbcba → acba. 2

3. Given a sequence of n numbers $A(1)...A(n)$, design an algorithm for finding a contiguous subsequence $A(i)...A(j)$ using divide and conquer method for which the sum of elements in the subsequence is maximum. 4
Example: {-2, **11, -4, 13**, -5, 2} → 20 and {1, -3, **4, -2, -1, 6**} → 7

4. Design an algorithm to determine whether a graph is connected or not? Analyze its time complexity. 3

5. At a rail-station, the schedule of trains arrival and departure times are given below in a table. Find the minimum number of platforms needed so that all the trains can be accommodated as per their schedule. 3

Rail	Arrival	Departure
A	09:00 hrs	09:30 hrs
B	09:15 hrs	13:00 hrs
C	10:30 hrs	11:00 hrs
D	10:45 hrs	11:45 hrs

S= abccbcba

f(S,A,i,j)
if(i=n)
return
if(S[i]==S[i+1]) {
A[j]= S[i+1]
i++; j++;
f(S,A,i,i)
}
else
f(S,A,i+1,j)

i+1++

f(S,n,i,j)
{ if(i==0)
if(S[n-1]==S[n-1]) {
n--;
f(S,n)
}
f(S,n)

9→A — 1
9:15 — A — 2
9:30 — D → 1
10:30 — A — 2
10:45 — A — 3
11 = D
11:D
13 - D

Sum

sum = max(s(A,i,j), s(A[j+1,n), sum)

a= 5
b= 8

if(i: a<m & j<n
if A[i]<B[j]
j++

else
t=A[i]
A[i]=B[j]
B[j]=t;
i++;
if(B[j]>B[j+1])
sort(B);

f(abccbcba)
f(abccbcba
4f(

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National Institute of Technology, Warangal
Department of Computer Science & Engineering

CS 6353 Principles of Data Warehousing and Data Mining

END Semester Examination **II year** – II Semester **MCA CSE**

Date: 08-05-2019 Time:2.30 PM to 5.30 PM Total Marks: **50**

*Answer **all** the Questions.*

1	A) Design a Data Warehouse for storing information of NITW, having dimensions department, student, faculty, course, semester etc. and measures marks, grades, CGPA, SGPA, credit. This Data Warehouse should be able to answer all the quires in various level of dimensions.	5M
	B) Explain different types of OLAP operations and perform the same operations on the data cube constructed in Question 1.A.	5M
2	A) Define Full Cube, Iceberg Cube, Closed Cube, Cube shell.	4M
	B) Explain Star-Cubing cube computation strategy for making Iceberg Cube.	6M
3	Let the set of items be {A, B, C, D, E} and minimum support be 30%; Apply Apriori algorithm to the following data of 10 transactions.	8M

TID	Items Bought	TID	Items Bought	TID	Items Bought	TID	Items Bought
T1	{ A, B, D, E }	T4	{ A, C, D, E }	T7	{ C, D }	T10	{ B, D }
T2	{ B, C, D }	T5	{ B, C, D, E }	T8	{ A, B, C }		
T3	{ A, B, D, E }	T6	{ B, D, E }	T9	{ A, D, E }		

A) Draw an itemset lattice representing the pattern space. Label each node in the lattice as follows:

N: If the itemset is not considered as a candidate itemset either because it is not generated at all or it is pruned after being generated because of an infrequent subset.
F: If the candidate itemset is frequent.
I: If the candidate itemset is infrequent.

B) What is the pruning ratio of Apriori algorithm on this data set and how many candidate itemsets are found to be infrequent after the support is counted?

C) Circle all the closed itemsets in the lattice and also make a rectangle around all the maximal itemsets

4	Build a decision tree classifier to classify bank loan application by assigning applications to one of three risk classes. Use Information gain as Attribute selection measure.	8M

Owns home	Married	Gender	Employed	Credit rating	Risk class (Class Label)
Yes	Yes	Male	Yes	A	B
No	No	Female	Yes	A	A
Yes	Yes	Female	Yes	B	C
Yes	No	Male	No	B	B
No	Yes	Female	Yes	B	C
No	No	Female	Yes	B	A
No	No	Male	No	B	B
Yes	No	Female	Yes	A	A
No	Yes	Female	Yes	A	C
Yes	Yes	Female	Yes	A	C

A - 3
B - 3
C - 4

5	A) Write the working principle for multilayer Feed-Forward Network to classify a test tuple.	4M
	B) Write the steps for BIRCH Hierarchical clustering algorithm.	4M
6	Cluster the given data points using DBSCAN Clustering algorithm. Data points are P1(1, 3), P2(4, 3), P3(12, 5), P4(11, 9), P5(10, 4), P6(4, 11), P7(4, 9), P8(11, 3), P9(14, 11), P10(3, 4), P11(12, 11), P12(3, 2), P13(3, 10), P14(13, 9), P15(6, 9). Use Euclidean distance for measuring the neighborhood with Epsilon distance = 4.5 & minimum points = 3.	6M

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NATIONAL INSTITUTE OF TECHNOLOGY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
END EXAMINATION, 07th May 2019
MCA- IV Sem
CS6352 – Computer Communications and Networking

Time: 3 hour | Max. Marks: 50

Answer ALL questions:

1. What is the serious limitation of distance vector routing? Explain? [5]
2. Given an IP address 172.16.0.0/25. What is the class of this IP? Find the number of subnets and the number of hosts per subnet. Also, for the first subnet block, find the subnet address, first host ID, last host ID and broadcast address. [6]
3. The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet? [3]
4. An IP datagram of size 1000 bytes arrives at a router. The router has to forward this packet on a link whose MTU (maximum transmission unit) is 100 bytes. Assume that the size of the IP header is 20 bytes. Compute the number of fragments that the IP datagram will be divided into for transmission. [3]
5. Discuss closed loop Congestion Control with neat sketch [5]
6. Illustrate the techniques to improve QoS. [5]
7. a. In an IPv4 packet, the value of HLEN is 1000 in binary. How many bytes of options are being carried by this packet? [2]

   b. In an IPv4 datagram, the *M* bit is 0, the value of HLEN is 5, the value of total length is 200, and the offset value is 200. What is the number of the first byte and number of the last byte in this datagram? Is this the last fragment, the first fragment, or a middle fragment? [4]
8. Discuss ICMP protocol with its important functionality [6]
9. Explain Syn Flooding attack [3]
10. For a host machine that uses the token bucket algorithm for congestion control, the token bucket has a capacity of 1MB and the maximum output rate is 20 MBPS. Tokens arrive at a rate to sustain output at a rate of 10 MBPS. The token bucket is currently full and the machine needs to send 12MB of data. Compute the minimum time required to transmit the data. [4]
11. Briefly discuss message access protocols [4]

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NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
MCA, II Year II-Semester

Sem End Examination, May 2019

Sub: Machine Learning
Time: 3 hours

Date: 10-5-2019
Max. 50

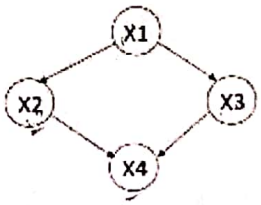
NOTE: Answer all the questions

1. Assume the probability of a certain disease is 0.01. The probability of testing positive given that a person is infected with the disease is 0.95 and the probability of testing positive given the person is not infected with the disease is 0.05. [4M]

(a) Calculate the probability of testing positive. 0.059

(b) Use Bayes' Rule to calculate the probability of being infected with the disease given that the test is positive. 0.161016

2. Consider the Bayes network below, defined over four Boolean variables. [12M]



a) How many parameters are needed to define $P(X_1,X_2,X_3,X_4)$ for this Bayes Net?
b) Give the formula that calculates $P(X_1 = 1,X_2 = 0,X_3 = 1,X_4 = 0)$ using only the Bayes net parameters. Use notation like $P(X_1 = 0|X_2 = 1,X_4 = 0)$ to refer to each Bayes net parameter you use in your formula.
c) Give the formula that calculates $P(X_1 = 1,X_4 = 0)$ using only the Bayes net parameters.
d) Give the formula that calculates $P(X_2 = 1|X_3 = 0)$ using only the Bayes net parameters.

3. Describe in brief [9M]

1. Lazy and eager learning
2. Collaborative filtering
3. Bayesian Belief networks.

4. What is kernel? How kernel can be used with SVM to classify non-linearly separable data? Also, list standard kernel functions. [6M]

5. Determine the Principal Components for the given 2-Dimensional dataset, (1, 2), (2, 4), (3, 6). [5M]

$\frac{1}{100} \times \frac{95}{100} + \frac{99}{100} \times \frac{5}{100}$

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0.666
0.333

6. For a SunBurn dataset given below, construct a decision tree [6M]

Name	Hair	Height	Weight	Location	Class
Sunita	blonde	average	light	no	yes
anit	blonde	tall	average	yes	no
kavita	brown	short	average	yes	no
sushma	blonde	short	average	no	yes
xavier	red	average	heavy	no	yes
balaji	brown	tall	heavy	no	no
ramesh	brown	average	heavy	no	no
swetha	blonde	short	light	yes	no

$P = 3$
$N = 4$

7. Consider a multilayer feed forward neural network. Enumerate and explain steps in back propagation algorithm use to train network. [8M]

$-4\alpha + 2\beta_1 = 0$
$4\alpha - 2\beta_1 = 0$

$-4 + 4 = 0$
$2 - 2 = 0$

$\lambda^2 - 5\lambda + 8$

$\alpha_1 = 1$
$\beta = 2$

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NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

END Examination, May 2019

Sub : Image Processing

Time : 3 Hrs.

Date: 09-05-2019

Max. Marks: 50

1 You are preparing a report and have to insert in it an image of size 4096×4096 pixels. 4M

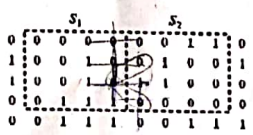
(a) Assuming no limitations on the printer, what would be the resolution per mm have to be for the image to fit in a space of size 5×5 cm?

(b) What would the resolution have to be in dpi for the image to fit in 2×2 inches?

2 Consider the image segment shown below. Let V={1,2,3,4,5,6,7,8}. Compute the lengths of the shortest 8-path between *a* and *b*. 3M

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & \boxed{7} & 8 \\ 2 & 3 & 4 & 5 & 6 & 7 & 8 & 1 \\ 3 & 4 & 5 & 6 & 7 & 8 & 1 & 2 \\ 4 & 5 & 6 & 7 & 8 & 1 & 2 & 3 \\ 5 & 6 & 7 & 8 & 1 & 2 & 3 & 4 \\ 6 & 7 & 8 & 1 & 2 & 3 & 4 & 5 \\ 7 & 8 & 1 & 2 & 3 & 4 & 5 & 6 \\ 8 & \boxed{1} & 2 & 3 & 4 & 5 & 6 & 7 \end{bmatrix}$$

3 Consider the two image subsets S1 and S2, shown in the following figure. For V = {0}, determine whether these two subsets are (a) 4-adjacent, (b) 8-adjacent, or (c) m-adjacent. 3M



4 Assume that, the image (a) is a gray image with ranges 0 to 255. The size of the image is 256×256. Give a suitable mask so that if we do the AND operation, the resultant image should have only the entire building without the statue. Assume that, the size of the statue is 40×20. 4M

5 Consider the following color image and intensity distributions. Get the histogram equalized image color image for this. 7M

Value	RED Band	GREEN Band	BLUE Band
0	790	656	245
1	1023	329	122
2	850	245	81
3	656	122	790
4	329	81	1023
5	245	790	850
6	122	1023	656
7	81	850	329

6 What is the difference between Image Enhancement and Image Restoration 2M

7 If an image with *n* gray values, and the probability of each values is same, what is the entropy of that image. 4M

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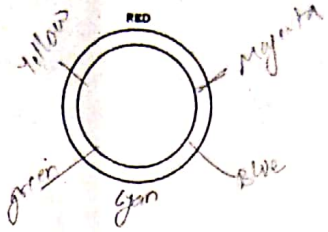
8 Complete the circle labeling, which are for complements on color circle. 5M



10 Use LZW compression technique and give the result for the following image. 7M

256

$$\begin{bmatrix} 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \end{bmatrix}$$

9 Give the Hit-or-Miss transformation result for the following binary image, using the structuring elements B1 and B2 5M

$A \circledcirc B = (A \ominus B) - (A \ominus B_2)$

9x16

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$B_1 = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix} \quad B_2 = \begin{bmatrix} & 1 & \\ 1 & 1 & 1 \\ & 1 & \end{bmatrix}$$

11 In the calculation of HOG, if the Magnitude Cell and Direction Cell are as given below. Calculate the 1×9 feature vector. 6M

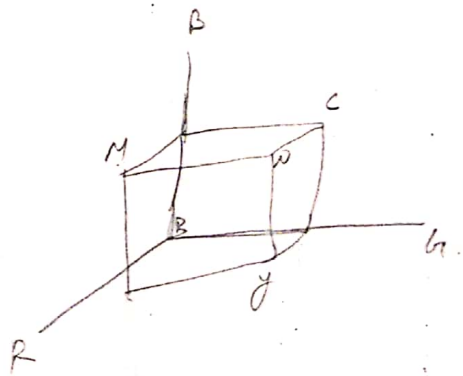
$$\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \end{array} \begin{bmatrix} 7 & 5 & 6 & 7 & 5 & 3 & 9 & 7 \\ 6 & 4 & 5 & 6 & 5 & 6 & 5 & 4 \\ 9 & 7 & 6 & 0 & 4 & 7 & 5 & 6 \\ 4 & 3 & 8 & 6 & 7 & 9 & 5 & 6 \\ 7 & 8 & 6 & 4 & 5 & 6 & 7 & 9 \\ 5 & 6 & 7 & 5 & 6 & 4 & 9 & 6 \\ 5 & 4 & 4 & 3 & 7 & 9 & 6 & 4 \\ 3 & 5 & 7 & 9 & 5 & 7 & 5 & 6 \end{bmatrix}$$

Magnitude Cell

$$\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \end{array} \begin{bmatrix} 20 & 40 & 60 & 20 & 80 & 160 & 120 & 140 \\ 80 & 60 & 20 & 60 & 40 & 20 & 80 & 120 \\ 140 & 20 & 140 & 120 & 40 & 20 & 80 & 100 \\ 100 & 120 & 140 & 120 & 140 & 160 & 120 & 140 \\ 180 & 120 & 60 & 20 & 40 & 20 & 40 & 80 \\ 120 & 100 & 140 & 20 & 40 & 60 & 160 & 140 \\ 20 & 40 & 20 & 40 & 140 & 160 & 160 & 120 \\ 20 & 40 & 20 & 40 & 20 & 40 & 20 & 120 \end{bmatrix}$$

Direction Cell

C — R
M — G
Y — B



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Department of Computer Science and Engineering
National Institute of Technology, Warangal
II/III M.C.A End Semester Examination, May 2019

SOFTWARE ARCHITECTURE

Time:3 Hours | Answer all the following | Marks:50

1	How architectures are influenced by system stake holders.	5
2	Explain about the process and product(structural) recommendations.	5
3	Why software architecture is important. How architecture is used as the vehicle for stakeholders communication. early design, team	5
4	There were a number of useful architectural structures and there are many more. which one should an architect work on? which one should the architect document?	5
5	In addition to the quality that apply directly to a system, a number of business quality goals frequently shape a system architecture. Discuss various business quality goals. CTPTRI	5
6	Explain about the architecture qualities related to the business environment system.	5
7	Briefly explain about the fault detection, fault recovery and fault prevention in detail.	5
8	Discuss about the Evolutionary delivery life cycle. When can I start begin designing the architecture.	5
9	Explain the uses of the Architectural documentation.	5
10	Software Architecture reconstruction comprises the various activities carried out iteratively. Explain?	5

Detection
Diagnosis
Recovery
Error
Prevention
Shadowing
Spare
Hot
Warm
Pre
Removal of Error

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CCN END LAB

SET 2 (Even Roll Numbers)

Q1) Build a simple client-server system, where you use the client to chat with a dummy "math" server. The protocol between the client and server is as follows.
The server is first started on a known port.
The client program is started (server IP and port is provided on the command line).
The client connects to the server, and then sends a simple **infix** expression string to the server via the connected socket.
The server reads input from the client socket, evaluates the expression to postfix, and sends the result back to the client.
The client should display the server's reply and prompt the next input, until the user terminates the client program with Ctrl+C.

Q2) P is an IP address conversion process - it converts the IPv4 address it receives in dotted decimal format to binary and vice versa. A client process who wants to employ P's service writes their addresses into a fifo. P reads this address, converts its format and sends it back to the client using fifo. P handles address conversion requests concurrently. Write a client-server program to implement the above scenario.

Note : Use separate fifo for each address format.

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