Computer Engineering Department, S.V.N.I.T., Surat.
Mid-Semester Examinations, September 2017
B. Tech III (Semester V)
Artificial Intelligence and Machine Learning (CO305)

Dated: 21st Sep 2017 **Time: 14:00 to 15:30 hrs.**
Max Marks: 30
Instructions: **B Tech Admission No:**

1. Write B. Tech. Admission No/Roll No and other details clearly on the answer books while write your B. Tech. Admission No. on the question paper, too.
2. Assume any necessary data but give proper justifications.
3. Be precise and clear in answering the questions.

Q.1 Answer the following (Any Four) **16**

1 Explain the best suitable statistical learning model with necessary equations for following two different datasets.

A For 50000 training instances, to predict weather the sales will increase or decrease by spending money in different advertisement media such as TV, Radio, Newspaper. Sampled dataset is following

TV (In Lakhs)	Radio (In Lakhs)	Newspaper (In Lakhs)	Sales Increase
230.1	37.8	69.2	Yes
44.5	39.3	45.1	No
17.2	45.9	69.3	No
151.5	41.3	58.5	Yes
180.8	10.8	58.4	Yes
8.7	48.9	75	No
57.5	32.8	23.5	No

B For 100000 training instances, to predict the ERP: estimated relative performance (value range is 0 to 5000) of computer hardware from the different parameters such as MYCT: machine cycle time in nanoseconds (value range is 0 to 150), MMIN: minimum main memory in kilobytes (value range is 128 to 64000), MMAX: maximum main memory in kilobytes (value range is 128 to 64000), CACH: cache memory in kilobytes (value range is 16 to 1024), CHMIN: minimum channels in units (value range is 1 to 64), CHMAX: maximum channels in units (value range is 16 to 256), from the following dataset. Sampled dataset is following

MYCT	MMIN	MMAX	CACH:	CHMIN	CHMAX	ERP
125	256	6000	256	16	128	199
29	8000	32000	32	8	32	253
29	8000	32000	32	8	32	253
29	8000	32000	32	8	32	253
29	8000	16000	32	8	16	132
26	8000	32000	64	8	32	290
23	16000	32000	64	16	32	381
23	16000	32000	64	16	32	381
23	16000	64000	64	16	32	749
23	32000	64000	128	32	64	1238

2 "As the dimensionality increases, the classifier's performance increases" Justify the statement with suitable example.

3 Formulate and explain the Bayes theorem. Also mentation the limitation of Bayes theorem.

4 Write predicates for knight tour problem.

5 Write predicates to find the last element of a given list.

Q.2 Build the best suited prediction model for following competition dataset predicting the Profit. Mention the stopping criteria of the model and prepare the optimum model. Justify your model selection compared to other atleast one technique. **08**

Age	Competition	Type	Profit
Old	Yes	Software	No
Old	No	Software	No
Old	No	Hardware	No
Mid	Yes	Software	No
Mid	Yes	Hardware	No
Mid	No	Hardware	Yes
Mid	No	Software	Yes
New	Yes	Software	Yes
New	No	Hardware	Yes
New	No	Software	Yes

Q.3 The 8 puzzle consists of eight numbered, movable tiles set in a 3x3 frame. One cell of the frame is always empty thus making it possible to move an adjacent numbered tile into the empty cell. Draw a complete search tree for given Start and Goal state, up to depth level 3 (where Start state is at depth 0) and give unique ID to each node of the tree. **06**

Give the Node Traversal sequence for the following search approaches

1) Brute-Force Approach
2) Depth-First Search (DFS)
3) Depth-First Iterative Deepening (DFID) Search
4) Hill Climbing (where heuristic function h = number of tiles that are not in the correct place (not counting the blank))

Start state

1	2	3
4	8	5
7	6	

Goal state

1	2	3
	8	5
4	7	6

Also comment on the performance of all the search techniques.

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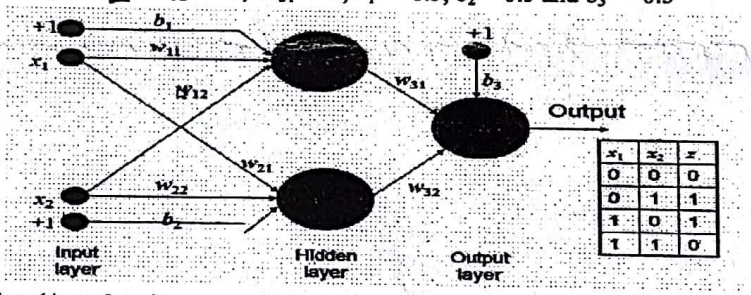
Computer Engineering Department, S.V.N.I.T., Surat.
End Semester, Nov-Dec 2017
B. Tech III (CO) 5th SEMESTER
Artificial Intelligence and Machine Learning (CO305)

Dated: 30thNov2017 **Time: 12:00 to 15:00 hrs.**
Max Marks: 100
B.Tech Admission No:
Instructions:

- Write your B. Tech. Admission No/Roll No and other details clearly on the answer books while write your B. Tech. Admission No. on the question paper, too.
- Assume any necessary data but give proper justifications.
- Numbers in right indicates marks
- Be precise and clear in answering the questions.

Q.1 Answer the following **[50]**

1. Compare the followings (Any three) **12**
   1. Linear Regression vs Logistic Regression
   2. Mean Value Replacement vs Constant Value Replacement vs Average Value Replacement
   3. Overfitting vs Underfitting
   4. ID3 vs C4.5
2. Construct by hand a neural network that computes the given below functions of two inputs. (initialize weight and bias = 0, for activation function use sigmoid function and learning rate = 0.5, perform at least three epochs) **10**
   1. NOR
   2. AND
3. Consider the following Multi-Layer feed-forward Neural Network with two input, 1 Hidden layer and 1 output layer where x_1 and x_2 are input vector and z output. Verify that the network shown in the figure solves an XOR problem for the following two different set of weights and bias.(for activation function use sigmoid function) **10**
   1. $W_{11} = W_{12} = W_{22} = W_{21} = W_{32} = -1$, $W_{31} = -1$, $b_1 = +1.5$, $b_2 = b_3 = -0.5$
   2. $W_{11} = W_{12} = W_{22} = W_{21} = W_{32} = +1$, $W_{31} = -3$, $b_1 = -1.5$, $b_2 = 0.5$ and $b_3 = -0.5$



x_1	x_2	z
0	0	0
0	1	1
1	0	1
1	1	0

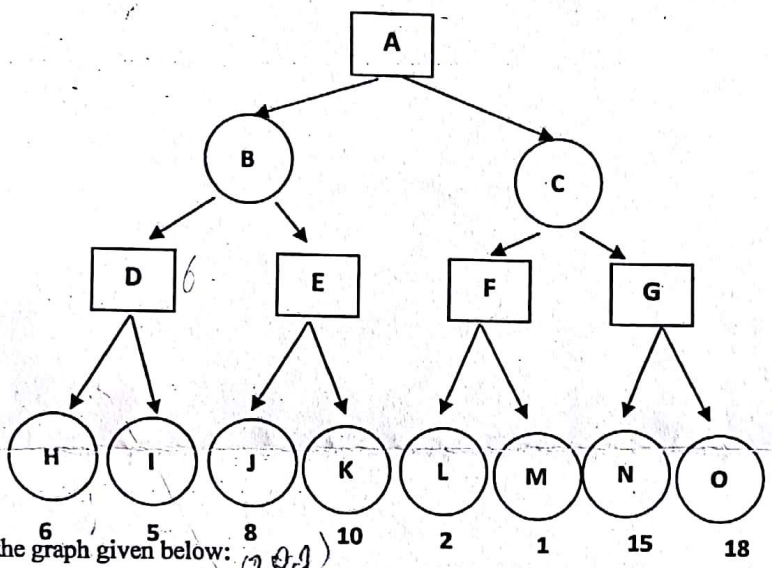
4. **Answer the following (Any three)** **18**
   1. Discuss an Ensemble Model in detail. What are the benefits of ensemble model?
   2. Explain the following machine learning algorithm and point out their pros and cons
      a. SVM
      b. K-Mean
   3. Write PCA algorithm for dimensionality reduction. Suggest drawbacks to improve the working of PCA algorithms.
   4. Clustering has been popularly recognized as an important machine learning technique with broad applications. Give one application example for each of the following cases:
      a. An application that takes clustering as a major data mining function
      b. An application that takes clustering as a preprocessing tool for data preparation for other data mining task

Q.2 Answer the following(Any Six) **[30]**

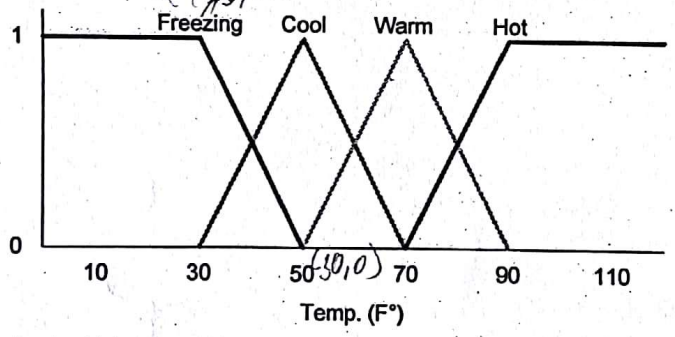
1. Explain two approaches used by regression to perform classification?
2. Give the Algorithm for BFS and DFS and explain it in detail.
3. Describe A* search and give the proof of optimality of A*.
4. Explain in detail about problem solving approaches.
5. How to improve the effectiveness of a search based problem solving technique?
6. Describe the Min-Max Algorithm and Alpha –beta Pruning
7. Differentiate between prepositional versus first order logic

Q.3 Answer the following **[20]**

1. Given the following search tree, apply the alpha-beta pruning algorithm to it and show the search tree that would be built by this algorithm. Make sure that you show where the alpha and beta cuts are applied and which parts of the search tree are pruned as a result.



2. Consider the graph given below:



a) Write the membership functions corresponding to the fuzzy sets. Hence answer the question: How cool is 36°F?
b) Explain the methods of defuzzification.
c) Elaborate on Fuzzy Inference Systems.