2017/EVEN/08/24/MCS–1004 (C)/
MS–404 (C)/576

PG Even Semester (CBCS) Exam., May—2017

COMPUTER SCIENCE

(10th Semester/4th Semester)

Course No. : MCS–1004 (C)/MS–404 (C)

(Machine Learning)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* What do you mean by well posed learning problems? Specify the task, performance measure and training experience for handwriting recognition learning problem. 6

(b) Explain briefly the concept learning task in machine learning with example. 6

(c) What do you mean by inductive learning hypothesis? 3

2. *(a)* Discuss general to specific ordering of hypothesis in machine learning with suitable example. 6

(b) Write Finds algorithm. Explain the Finds algorithm for finding maximally specific hypothesis with suitable example. 9

UNIT—II

3. Write candidate elimination algorithm. Find the version space by using candidate elimination algorithm for the concept learning task "days on which my friend Ram enjoy water sport", as given below : 15

Days	*Sky*	*Air Tem.*	*Humidity*	*Wind*	*Forecast*	*Enjoy Water Sport*
D_1	Sunny	Warm	Normal	Strong	Same	Yes
D_2	Sunny	Warm	High	Strong	Same	Yes
D_3	Rainy	Cold	High	Strong	Change	No
D_4	Sunny	Warm	High	Weak	Change	Yes

4. *(a)* Define general boundary and specific boundary for version space with suitable example. 5

(b) Explain inductive and analytical learning problems with suitable example. 5

(c) Write List-then-Eliminate algorithm, and explain the algorithm with suitable example. 5

UNIT—III

5. Write Hebb Net algorithm for classification problem. By using Hebb Net rule, classify the AND function with bipolar inputs and bipolar targets as given below : 15

Input	*Target*
$(x_1, x_2, 1)$	
(1, 1, 1)	1
(1, –1, 1)	–1
(–1, 1, 1)	–1
(–1, –1, 1)	–1

6. Write the perceptron algorithm for pattern classification problem. By using perceptron algorithm, classify the AND function with binary inputs and bipolar targets as given below : 15

Input	*Target*
$(x_1, x_2, 1)$	
(1, 1, 1)	1
(1, 0, 1)	–1
(0, 1, 1)	–1
(0, 0, 1)	–1

(At least up to 3rd epoch)

UNIT—IV

7. *(a)* What do you mean by decision tree representation of a concept learning problem? Explain with an example. 5

(b) Write ID3 algorithm for finding a decision tree. 5

(c) Explain entropy and gain measure with suitable example. 5

8. By using ID3 algorithm, find a decision tree for the following concept learning task : 15

Days	*Outlook*	*Temp.*	*Humidity*	*Wind*	*Play Tennis*
D_1	Sunny	Hot	High	Weak	No
D_2	Sunny	Hot	High	Strong	No
D_3	Overcast	Hot	High	Weak	Yes
D_4	Rain	Mild	High	Weak	Yes
D_5	Rain	Cool	Normal	Weak	Yes
D_6	Rain	Cool	Normal	Strong	No
D_7	Overcast	Cool	Normal	Strong	Yes
D_8	Sunny	Mild	High	Weak	No
D_9	Sunny	Cool	Normal	Weak	Yes
D_{10}	Rain	Mild	Normal	Weak	Yes
D_{11}	Sunny	Mild	Normal	Strong	Yes
D_{12}	Overcast	Mild	High	Strong	Yes
D_{13}	Overcast	Hot	Normal	Weak	Yes
D_{14}	Rain	Mild	High	Strong	No

UNIT—V

9. *(a)* Derive the gradient descent rule in machine learning and hence write the gradient descent algorithm. 6

(b) Derive back propagation algorithm for stochastic gradient descent and hence write the back propagation algorithm for stochastic gradient descent. 9

10. *(a)* Define sample complexity, computational complexity and mistake bound in concept learning. 3

(b) Explain, what you mean by "probably learning an approximately correct hypothesis". 6

(c) What do you mean by instance based learning? Write *k*-nearest neighbour algorithm for approximating a discrete valued function. 6

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