Mid Semester Examination

Course Name: Artificial Intelligence-II   **Code:** CS 349

Full Marks-50   **Time:** 2 hours

Answer ALL the questions

Make reasonable assumptions as and whenever necessary. You can answer the questions in any sequence. However, the answers to all the parts of any particular question should appear together.

1(a). What could be the drawbacks of strict sequence assumption for document classification? What is the remedy for this?

1(b). For a document classification problem, assume that the training set comprises the following five documents. The respective classes are also shown:

D1: {Learning, Reinforcement, Regression}, Class=ML

D2: {Memory, CPU, Starvation}, Class= OS

D3: {Learning, Loss, Memory}, Class=ML

D4: {CPU, Semaphore, Regression}, Class= OS

D5: {Reinforcement, Starvation, Error }, Class= ML

Estimate a multinomial naïve Bayes classifier, and apply this classifier to the following test document (*explain each step and decide which class to be assigned to the test document*)
D: {Learning, Learning, Learning, Starvation, CPU, Regression}

1(c). Under what constraints, Multivariate and Multinomial models will perform the same for the case 1(b) above? Explain with the necessary steps.   **(1.5+1.5+10+4)=17**

2 (a). For each pair of atomic sentences, give the most general unifier (MGF), if it exists, with proper reasoning.

   i. P (A, B, B), P (x, y, z)

   ii. Older (Father (y), y), Older (Father (x), John)

2(b). Consider the following two sentences in the language of First Order Logic.

$\forall x \exists y (x >=y); \exists y \forall x (x>=y)$

   i. Assume that the variables range over all the natural numbers and the predicate >= means "is greater than or equal to" . Under this interpretation, translate (A) and (B) into English.

ii. Is (A) true under this interpretation?

iii. Is (B) true under this interpretation?

iv. Does (A) logically entail (B)?

v. Does (B) logically entail (A)?

(Explain the answers with appropriate reasoning)

2 (C). "Backward chaining is more effective than Forward chaining algorithm"- Explain this statement with proper intuition. $\qquad$ (2 +2.5) + (2.5+ 2.5 + 2.5 +3 + 3) + 2.5 = 20.5

3(a). Explain with an example why sequence learning is important? Why is Markov assumption necessary for solving a real problem? Show the detailed steps of the Forward Recursion algorithm for computing the probability of an observation sequence. How is the best state sequence determined for a given observation sequence? *(show with mathematical steps)* $\qquad$ (1.5+ 1.5+ 6 + 3.5) = 12.5

Best of Luck