Natural Language Processing

Assignment- 0

TYPE OF QUESTION: MCQ

Number of questions: 20 **Total mark: 20 X 1 = 20**

QUESTION 1:

Which of the following statements is false?

a. Context Free Language is a subset of Context Sensitive Language
b. Regular Language is a subset of Context Sensitive Language
c. Context Sensitive Language is a subset of Context Free Language
d. Recursively Enumerable Language is a superset of Regular Language

Correct Answer: c

Detailed Solution:

QUESTION 2:

Bag I contains 4 Blue and 6 Red balls while another Bag II contains 4 Blue and 3 Red balls. One ball is drawn at random from one of the bags and it is found to be Red. Find the probability that it was drawn from Bag II?

a. 0.588
b. 0.407
c. 0.675
d. 0.389

Correct Answer: a

Detailed Solution:

QUESTION 3:

Which among the following can parse a Context Free Grammar?

a. Top Down parser
b. Bottom Up parser

c. CYK algorithm
d. All of the above

Correct Answer: d

Detailed Solution:

QUESTION 4:

The pumping lemma is often used to prove that a language is:

a. Context free
b. Not context free
c. Regular
d. None of the above

Correct Answer: b

Detailed Solution:

QUESTION 5:

When a top-down approach of dynamic programming is applied to a problem, it usually:

a. Decreases both the time complexity and space complexity
b. Decreases the time complexity and increases the space complexity
c. Increases the time complexity and decreases the space complexity
d. Increases both, the time complexity and space complexity

Correct Answer: b

Detailed Solution:

QUESTION 6:

Suppose that the probability of event A is 0.2 and the probability of event B is 0.8. Also, suppose that the two events are independent. Then calculate P(A|B).

a. 0.2
b. 0.16

c. 0.36
d. None of the above

Correct Answer: a

Detailed Solution:

QUESTION 7:

The Context Free Languages are closed under:

a. Intersection
b. Complement
c. Kleene Closure
d. All of the above

Correct Answer: c

Detailed Solution:

QUESTION 8:

If A is a 4×4 matrix with det(A)=−1, compute det(−3A).

a. 3
b. -48
c. 81
d. None of the above

Correct Answer: c

Detailed Solution:

QUESTION 9:

A medical treatment has a success rate of 0.7. Two patients will be treated with this treatment. Assuming the results are independent for the two patients, what is the probability that neither one of them will be successfully cured?

a. 0.4

b. 0.09
c. 0.21
d. 0.49

Correct Answer: b

Detailed Solution:

QUESTION 10:

A Context Free Grammar (CFG) is ambiguous if:

a. It has more than one rightmost derivations
b. It has more than one leftmost derivations
c. No parse tree can be generated for the CFG
d. None of the above

Correct Answer: b

Detailed Solution:

QUESTION 11:

Regular expression for all strings starts with 'ab' and ends with 'bba' is:

a. aba*b*bba
b. ab(ab)*bba
c. ab(a+b)*bba
d. All of the above

Correct Answer: c

Detailed Solution:

QUESTION 12:

Find all eigenvalues for the matrix A if $A = \begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$

a. 1, 4, 8
b. 0, 3, −4
c. 3, 7, 2
d. None of the above

Correct Answer: b

Detailed Solution:

QUESTION 13:

Find the inverse of the matrix $M = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$

a. $\begin{bmatrix} 2 & 0 & -1 \\ 1 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} 3 & 1 & 0 \\ 1 & -2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$

c. $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 2 & -1 \\ 2 & 2 & 1 \end{bmatrix}$

d. None of the above

Correct Answer: a

Detailed Solution:

QUESTION 14:

If we randomly pick two television sets in succession from a shipment of 240 television sets of which 15 are defective, what is the probability that they will both be defective?

a. $\left(\frac{15}{240}\right)^2$

b. $\left(\frac{15}{240} \times \frac{14}{239}\right)$

c. $1 - \left(\frac{15}{240}\right)^2$

d. $\left(\frac{15}{240} + \frac{14}{239}\right)$

Correct Answer: b

Detailed Solution: First draw is defective with prob. $\frac{15}{240}$ and the second one with prob $\frac{14}{239}$(as one defective TV has already been removed in first draw). It will be a product of these two probabilities as we need both these events to occur.

QUESTION 15:

Find the row rank of the matrix

$$R = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 3 & 2 & 9 \\ 1 & 5 & 5 & 13 \\ 1 & -1 & 1 & -5 \end{bmatrix}$$

a. 3

b. 1

c. 4

d. 2

Correct Answer: d

Detailed Solution:

QUESTION 16:

In Orange County, 52% of the adults are males. Among males of that county, 9% are smokers and among females 3% are smokers. For a randomly selected subject, who is a smoker, what is the probability that the subject is a male?

a. $\frac{9}{100}$

b. $\frac{9}{100} \times \frac{52}{100}$

c. $\frac{13}{17}$

d. $\frac{9}{52}$

Correct Answer: c

Detailed Solution: Apply Bayes Theorem and Law of total probability

---

QUESTION 17:

What is the (Levenshtein) edit distance between “swift” and “sweet”? (Assume costs for deletion, insertion and substitution to be 1,1,2 respectively)

a. 2
b. 3
c. 4
d. None of the above

Correct Answer: c

Detailed Solution: 2 substitutions or a total of 4 ins + del operations. Both have a cost of 4

QUESTION 18:

Which of the following is/are property/properties of a dynamic programming problem?

a. Optimal substructure
b. Overlapping subproblems
c. Greedy approach
d. Both optimal substructure and overlapping subproblems

Correct Answer: d

Detailed Solution:

QUESTION 19:

Let A and B be events such that $P(A) = \frac{1}{2} = P(B)$ and $P(A^c \cap B^c) = \frac{1}{3}$. Find the probability of the event $A^c \cup B^c$.

a. $P(A^c \cup B^c) = \frac{2}{3}$
b. $P(A^c \cup B^c) = \frac{1}{3}$
c. $P(A^c \cup B^c) = \frac{1}{2}$
d. $P(A^c \cup B^c) = \frac{3}{4}$

Correct Answer: a

Detailed Solution: Use Venn diagrams or apply the de morgan's law

---

QUESTION 20:

What is the expression for time complexity for finding Fibonacci number using recursion?

a. $T(n) = T(n-1) + O(n)$
b. $T(n) = T(n-1) + T(n/2)$
c. $T(n) = 2 * T(n/2) + O(1)$
d. $T(n) = T(n-1) + T(n-2)$

Correct Answer: d

Detailed Solution: $T(n) = T(n-1) + T(n-2)$. Since, for fib(n) both fib(n-1) and fib(n-2) needs to be calculated in recursion.

**********END*******