

Department of Computer Science and Engineering, MNIT Jaipur

ETE, M.Tech. II Semester (spring 2023-24), Software Testing and Validation (21CST838)

Time: two and half hours

1. Write short answers:-

Max.Marks: 50

- (i) What do you mean by test assessment? (1)
 - ✓ (ii) What do you mean by Test Adequacy Criterion? (2)
 - ✓ (iii) What is Pesticide Paradox? (1)
 - ✓ (iv) When to stop (close) testing? Explain. (3)
 - (v) What do you mean by Test Enhancement? Explain. (2)
 - ✓ (vi) Why is it necessary to develop test cases for both valid and invalid input conditions? Justify. (2)
2. Name various software testing categories/classes, then explain "Level wise testing" in detail. (1+6=7)
3. (i) What is static testing? Explain various types of Work documents used in static testing. (1+5=6)
- ✓ (ii) Explain STLC in detail. (5)
4. Take a suitable example (program code/ flow chart) then construct its CFG, and then explain Decision coverage, Condition/Decision coverage, multiple condition coverage and MCDC. Also explain Basis Path testing in detail. (1+1+2+2+2+3+4=15)
5. Write short notes on (any two of the following) --
- (i) Mutation Testing, (ii) Regression Testing, (iii) Data flow Testing. (3*2=6)

Adv

(a) Section 66 (66A, 66B, 66C)
(b) Section 67 (67A, 67B, 67C)

pm 5:30 pm

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Department of Computer Science & Engineering, MNIT, Jaipur
Natural Language Processing 21CST822 ETE, May 2024

Max. Marks: 50

Attempt all questions.

Time: 150 Minutes

1. (a) Consider the following grammar and generate the CKY parsing table for the sentence "I eat sushi with chopsticks with you" : [3]

S → NP VP	VP → Verb NP	NP → you
NP → NP PP	VP → VP PP	PP → Prep NP
NP → sushi	NP → chopsticks	Verb → eat
NP → I	Prep → with	

- (b) Convert the following grammar in Chomsky Normal Form (CNF): [6]

S → A A → BA₁ | B | ε B → ab | ε A₁ → AB

2. Suggest additional information that can to be extracted from the question while Question Processing in Question-Answering systems, which can further improve the performance. Explain with suitable example. [5]

3. (a) Consider the following table of test results of seven questions which gives ranked answers as output. Compute the accuracy of the system using Mean Reciprocal Rank method. [2]

Question Number	1	2	3	4	5	6	7
Correct Answer Number	5	3	1	2	8	1	2

- (b) Compute the ROUGE-2 score for the following text: [2]

Human Summary: Water spinach is a commonly eaten leaf vegetable of Asia Pacific.

System Summary: Water spinach is a leaf vegetable commonly eaten in tropical areas of Asia Pacific.

4. Consider the following sentences (2,3,4,5) as set of reference sentences from document collection and sentence number 1 as a query sentence. Consider value of lambda (λ) 0.3 . Use cosine similarity to compute similarity between sentences. Find the maximal set of sentences to be selected in set of summary sentences (find only 3 sentences in final summary set) using maximal marginal relevance. [5]

Doc 1/sentence 1 **new home sales top forecasts**

Doc 2/sentence 2 **home sales rise in july**

Doc 3/sentence 3 **increase in home sales in july**

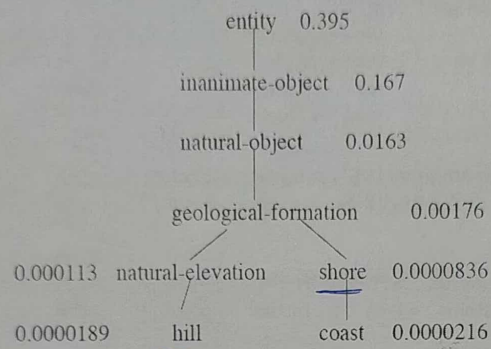
Doc 4/sentence 4 **july new home sales rise**

Doc 5/sentence 5 **sales home is very bad**

5. (a) Consider the training data given below for machine translation from English to French. Assume uniform initial translation probabilities. Compute translation probabilities and normalized alignment probabilities after one iteration. [5]

	1			2			3	
English	English	game		the	game		game	team
French	anglaise	jeu		la	jeu		jeu	equipe

- 5 (b) Consider following sub tree with probabilities. Compute sim_{path} , $\text{sim}_{\text{Resnik}}$ and sim_{Lin} between "hill" and "shore". [3]



6. Suggest a novel methodology that can handle co-references in English Text and evaluate it also. Explain it properly using a suitable example. [5]
7. Design and evaluate a novel recognition system capable of recognizing temporal expressions of the kind appearing in emails or conversations. Sample text is given below: [6]
 "I am free next month. Let's meet on first Friday." "Are you free on Wednesday?"
8. Consider the data of terms with their context counts given below. Compute final PPMI matrix for these rows. Also compute add one smoothed PPMI matrix. Compare the non smoothed PPMI and add one smoothed PPMI and write your observations. [8]

Term(rows)/Context(Columns)		Automobile	Computer	Money	Household	Politics
1	Car	2	0	1	0	0
2	Auto	3	1	0	0	1
3	Insurance	1	0	4	3	0
4	Window	1	2	1	2	1
5	Computer	0	4	1	0	0
6	Technology	1	3	1	1	1



MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Iyr M. Tech (CSE/CSIS), II Semester - End-Semester Examinations - May 2024
Cyber Security (21CST851)

Date: 07-05-2024

Time: 08:00 AM to 10:30 AM

Max. Marks: 50

Note: Answer all the questions. Attend questions in sequential order; starting from Q1.
Calculators and any other electronic gadgets are not allowed.

1. Explain following in detail with respect to x86 architecture. (4*1M=4M)
(a) Operands ✓
(b) Registers — *data storage dem* ✓
(c) Stack Layout
(d) Rep Instructions
2. Write about Windows networking APIs. How is WinINet API used by malware? (2*2M=4M)
3. What are the polymorphic and metamorphic malware programs? (2*2M=4M)
4. Suggest that to earn more revenue, malware authors would prefer which of the following attacks and why. Also briefly describe about these attacks. (2*2M=4M)
(a) System-call injection attack
(b) Shadow attack
5. Explain DNSSEC and NSEC3 defense tools. (2*3M=6M)
6. Compare and Contrast Android Security and IOS Security. (2*3M=6M)
7. (a) Define cyber forensics. ✓ (2M)
(b) Discuss any four mobile forensics tools. (4M)
8. Explain internal structure of Portable Executable (PE) file format of Windows OS? What are the infection techniques employed by attackers to store the malicious payload in PE format? (2*4M=8M)
9. Discuss IT Act 2000 for Cybercrimes. Explain following sections of IT Act 2000: (2M+3M+3M=8M)
(a) Section 66 (66A, 66B, 66C)
(b) Section 67 (67A, 67B, 67C)

pm 3:30 8/4/24
msy113



Malaviya National Institute of Technology Jaipur
Social Network Analysis (CST836)
End Term Examination

Date: May 8, 2024

Max marks: 50

Timing: 8:00 to 10:30 AM

Attempt all the questions

1. (a) For the given graph H , compute the followings:
 1. Chromatic number of graph H
 2. Number of edges and vertices in the complement of H
 3. Clustering Coefficient of nodes 5 and 9
 4. Betweenness Centrality of node 10
 5. Average Path Length for graph H
 6. Closeness Centrality of node 8
 7. Diameter of the graph H
 8. Maximum Matching and size of the maximum matching (Matching Number)
 9. Maximum Clique and size of maximum clique (Clique Number)
 10. Maximum Independent Set and size of the maximum independent set (Vertex Independence Number)
 11. Minimum Vertex Cover and size of the minimum vertex cover (Vertex Covering Number)
 12. Minimal Dominating Set of graph H

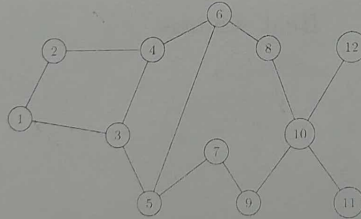


Figure 1: Graph H

- ✓ (b) Analyze the role of herd behavior in the spread of misinformation on social media platforms. How do algorithms that prioritize content based on popularity contribute to this phenomenon? Propose two strategies that could be implemented by social media companies to mitigate the negative effects of herd behavior in spreading false information. (8)
- 2. (a) Explain the role of centrality measures in identifying key influencers within a social network. Discuss at least three different types of centrality measures. (5)
- ✓ (b) Provide a detailed comparison between GCN, GAT, and GraphSAGE (highlighting their differences and unique characteristics). (5)
- ✓ 3. (a) For each of the questions below, write your answer either True or False. No explanations are needed.
- ✗ 1. A minimum spanning tree of a graph always contains the least number of edges possible to connect all vertices.
 - ✗ 2. The adjacency matrix of an undirected graph is always symmetric.
 - ✗ 3. A graph with no cycles is called a forest.
 - ✗ 4. In a bipartite graph, every cycle contains an even number of vertices.
 - ✗ 5. The clustering coefficient of a complete graph is 1. (5)
- ✓ (b) State and prove Havel Hakimi theorem. (5)
4. (a) Define the basic reproduction number R_0 in the context of the SIR model. Explain how R_0 can be used to determine the outbreak potential of an infectious disease. What does it mean epidemiologically if R_0 is less than, equal to, or greater than 1? (5)
- ✓ (b) Identify and summarize the key learning outcomes that you gained from your CST836 project. (5)

Best wishes

May-9, 2024

End Term Examination

Credits:2

Department of Computer Science and Engineering, MNIT Jaipur
Research Methodology (Academic Semester 2023-24 Even)

Time: 2.5 hrs

Max. Marks: 50

Note: Attempt any five questions.

X	8	6	-2	-5	-2	4	3	9	-5	7
Y	3	-7	1	6	-3	2	-5	4	-2	5

Table 1

- 1 (a) Given that mean weight of m copper disks is μ_m and n aluminum disks is μ_n . what would be the average weight of these $(m + n)$ disks? 10
(b) For data in Table 1, use LMS (Least Mean Square) Linear Regression to estimate the parameters m and c where $y = mx + c$.

- 2 (a) Solve the following set of equations using forward/backward substitution method. 10

$$\begin{array}{ccccccc|c|c}
 2 & -3 & 1 & -1 & 0 & 0 & 0 & x_1 & 8 \\
 0 & 2 & 1 & 3 & 0 & 0 & 0 & x_2 & 6 \\
 0 & 0 & 3 & 1 & 0 & 0 & 0 & x_3 & 6 \\
 0 & 0 & 0 & 2 & 0 & 0 & 0 & x_4 & 6 \\
 0 & 0 & 0 & 2 & -1 & 0 & 0 & x_5 & 8 \\
 0 & 0 & 0 & 3 & 1 & -1 & 0 & x_6 & 8 \\
 0 & 0 & 0 & 4 & -2 & 3 & 2 & x_7 & 13
 \end{array}$$

$$M = \begin{array}{cccc|c}
 2 & 3 & -1 & -2 & 8 \\
 -4 & -2 & 3 & 6 & 6 \\
 6 & 29 & 5 & 9 & 6 \\
 4 & 22 & 20 & 32 & 8
 \end{array}$$

- (b) Using LU decomposition, determine the value of determinant M.

Compute $E(X)$ for following cases. Here E is the expectation. 10

- 3 (a) Two dices are thrown, and sum of the outcomes is computed. X is a random variable that is 1 when sum of two dices is multiple of 4 and 0 otherwise.
(b) Three balls are selected (without replacement) from an urn containing 2 red, 3 black and 5 white balls. X is a random variable to indicate number of black balls.

- 4 (a) Determine convolution of following two sequences. Asterisk (*) indicates the value of sequence element at time $t = 0$. 10

$$X = 2^*, 5, -3, 1, -2$$

$$Y = 1^*, 1, -1, 1, 1$$

- (b) Compute 4-point FFT transform for the sequence 2, 3, 4, 5

- 5 (a) Consider data in Table 1 as ten 2D points on X - Y plane. Draw these points on a 2D plot with horizontal axis as X and vertical axis as Y . Assuming that points in each quadrant (there are four quadrants. Quadrant I where both x and y coordinates are +ve, Quadrant II where x is negative and y is positive, ...) form a cluster, compute the mean of every cluster. 10

- (b) Determine the distances between all clusters in a matrix form where $[i, j]$ entry shows distance between cluster i^{th} and j^{th} cluster.

- 6 (a) For sequences X and Y in Table 1, draw respective Box Plots on the same plot. 10

$$f(x, y) = \begin{cases} 2e^{-x}e^{-2y} & 0 < x < \infty, 0 < y < \infty \\ 0 & \text{otherwise} \end{cases}$$

- (b) For joint distribution function $f(x, y)$, determine $P\{X > 2, Y > 1\}$.

- 7 (a) Prove that $\text{Cov}(X, Y)$, defined as $E[(X - \mu_x)(Y - \mu_y)] = E[XY] - E[X]E[Y]$. 10

- (b) For a Gaussian distribution with mean = 100 and deviation = 20, determine z-score for 75 and 150.