

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
CYCLE TEST -I

DEPARTMENT : CSE
 DATE & TIME OF EXAM : 28th February 2024/ 3:30 -4:30 PM
 SUB CODE : CSPE64/ Data Analytics
 DURATION : 1 hour
 MARKS : 20

The course outcomes 1 and 2 (*Evaluate the use of data from acquisition through cleaning, warehousing, analytics, and visualization to the ultimate business decision, and Mine data and carry out predictive modelling and analytics to support business decision-making*) of the course is tested in this assessment.

Answer all the Questions

1. List out the different types of attributes with examples. (2)
2. An advertising agency conducted a random survey of adults asking about their primary source of news and educational level. (2+2)

Primary Source of News	Not High School Graduate	High School But Not College Graduate	College Graduate	Total
Newspapers	49	205	188	442
Television	203	665	223	1091
Internet	41	401	245	687
Total	293	1271	656	2220

- a. The advertising company wants to test whether there is a relationship between the 3 educational levels and the 3 primary news sources. Find the chi-square value for the above sample.
- b. Test the claim that among college graduates, their primary news source is equally divided among newspapers, television, and the internet.
 (Use the critical value method with a significance level of 0.05 for both)
3. What is the curse of dimensionality? Discuss briefly the different techniques used to overcome that. (3)
4. Test scores for a college statistics class held during the day are:
 99; 56; 78; 55.5; 32; 90; 80; 81; 56; 59; 45; 77; 84.5; 84; 70; 72; 68; 32; 79; 90

Test scores for a college statistics class held during the evening are:
 98; 78; 68; 83; 81; 89; 88; 76; 65; 45; 98; 90; 80; 84.5; 85; 79; 78; 98; 90; 79; 81; 25.5

- a. For each data set, what percentage of the data is between the smallest value and the first quartile? the first quartile and the median? the median and the third quartile? the third quartile and the largest value? What percentage of the data is between the first quartile and the largest value? (2)
- b. Create a box plot for each set of data. Use one number line for both box plots. Which box plot has the widest spread for the middle 50% of the data (the data between the first and third quartiles)? What does this mean for that set of data in comparison to the other set of data? (3)
5. Discuss briefly about the parametric data reduction techniques. (2)
6. Find the Jaccard Similarity between Jack and Jim, and Jim and Mary using the following data set. Explain your calculation. (4)

name	gender	fever	cough	test-1	test-2	test-3	test-4
Jack	M	Y	N	P	N	N	N
Jim	M	Y	Y	N	N	N	N
Mary	F	Y	N	P	N	P	N
:	:	:	:	:	:	:	:

Percentage Points of the Chi-Square Distribution

Degrees of Freedom	Probability of a larger value of χ^2								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21
11	3.053	4.575	5.578	7.584	10.341	13.70	17.28	19.68	24.72

2. Convert the following XML document into an XHTML t

```
<? Xml version = "1.0" ?>
<Students>

    <Student rollno="CS101">
        <name>John</name>
        <department>CSE</departmen
        <cgpa>9.5</cgpa>
    </Student>

    <Student rollno="EC107">
        <name>Rohit</name>
        <department>ECE</departri
        <cgpa>8.7</cgpa>
    </Student>

</Students>
```

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
CYCLE TEST -II

DEPARTMENT	: CSE
DATE & TIME OF EXAM	: 2 nd April 2024/ 3:30 -4:30 PM
SUB CODE	: CSPE64/ Data Analytics
DURATION	: 1 hour
MARKS	: 20

The course outcomes 2 and 4 (Mine data and carry out predictive modeling and analytics to support business decision-making, & Execute real-time analytical methods on streaming datasets to react quickly to customer needs) of the course tested in this assessment.

Answer all the Questions

1. Compare and contrast the different frequent itemset mining algorithms. (4)
2. In the PCY algorithm, during pass-2 of the algorithm, why can't you use the triangular matrix method for counting pairs? (2)
3. Suppose there are 100 items, numbered 1 to 100, and also 100 baskets, also numbered 1 to 100. Item i is in basket b if and only if b divides i with no remainder. Apply the Apriori algorithm and give the answers for the following. (5)
 - a. If the support threshold is 5, which items are frequent?
 - b. If the support threshold is 5, which pairs of items are frequent?
 - c. What is the sum of the sizes of all the baskets?
 - d. Show the calculation for the confidence of the following association rules:
 - a. $\{24, 60\} \rightarrow 8$.
 - b. $\{2, 3, 4\} \rightarrow 5$.
4. Derive the false-positive rate of a Bloom filter. Suppose we have n bits of memory available, and our set S has m members. Instead of using k hash functions, we could divide the n bits into k arrays, and hash once to each array. As a function of n, m, and k, what is the probability of a false positive? How does it compare with using k hash functions into a single array? (2+2)
5. Consider the collection of twelve baskets. Each contains three of the six items 1 through 6. (3)

$\{1, 2, 3\}$ $\{2, 3, 4\}$ $\{3, 4, 5\}$ $\{4, 5, 6\}$
 $\{1, 3, 5\}$ $\{2, 4, 6\}$ $\{1, 3, 4\}$ $\{2, 4, 5\}$
 $\{3, 5, 6\}$ $\{1, 2, 4\}$ $\{2, 3, 5\}$ $\{3, 4, 6\}$

Take as the sample the third row of baskets: i.e., one-third of the file. Our scaled down support threshold will be 1.

- (a) What are the itemsets frequent in the sample?
- (b) What is the negative border?
- (c) What is the outcome of the pass through the full dataset? Are any of the itemsets in the negative border frequent in the whole? *support t = 4*
what is next step of algo.
6. Discuss briefly about how you could use the concept of frequent itemsets to detect plagiarism in documents. (2)

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
END SEMESTER EXAMINATION

DEPARTMENT	: CSE
DATE & TIME OF EXAM	: 13 th May 2024 / 2:00 - 5:00 PM
SUB CODE	: CSPE64/ Data Analytics
DURATION	: 3 hours
MARKS	: 45

Answer all the Questions

1.
 - a. Discuss in detail simple and weighted moving average with equations. (5)
 - b. Distinguish between linear regression and autoregression. (2)
 - c. Briefly write about ACF and PACF with an example. (2)

2.
 - a. A psychologist wishes to test if preference of method of learning differs with gender. He asks a group of individuals their preferred method of learning. Below is a table of the results. Perform a test to see if a relationship exists. What do you infer from the test? (4)

	Male	Female
Visual	23	17
Auditory	13	35
Kinesthetic	30	28
 - b. Graph a box plot for the following data
 10; 10; 10; 15; 35; 75; 90; 95; 100; 175; 420; 490; 515; 515; 790 (3)
 - c. List out the different types of attributes with examples. (2)

3.
 - a. Consider the following collection of twelve baskets. Each contains three of the six items 1 through 6. (4)

$$\begin{aligned} &\{1, 2, 3\} \{2, 3, 4\} \{3, 4, 5\} \{4, 5, 6\} \\ &\{1, 3, 5\} \{2, 4, 6\} \{1, 3, 4\} \{2, 4, 5\} \\ &\{3, 5, 6\} \{1, 2, 4\} \{2, 3, 5\} \{3, 4, 6\} \end{aligned}$$

Suppose the support threshold is 4. On the first pass of the PCY Algorithm we use a hash table with 11 buckets, and the set $\{i, j\}$ is hashed to bucket $i \times j \bmod 11$. Which pairs are counted on the second pass of the PCY Algorithm?
 - b. Consider the same twelve baskets given in the previous question. Take as the sample the second row of baskets for the Toivonen's algorithm. Our scaled down support threshold will be 1. (3)
 - i. What is the negative border?
 - ii. What is the outcome of the pass through the full dataset with support threshold of 4? What does algorithm do next?

- c. Let there be I items in a market-basket data set of B baskets. Suppose that every basket contains exactly K items. As a function of I , B , and K , what is the largest possible number of pairs with a nonzero count? Briefly explain. (2)

4.

- a. Give the proof of the Flajolet-Martin algorithm. (4)
- b. Suppose we are using the DGIM algorithm to estimate the number of 1's in suffixes of sliding window of length 40. The current timestamp is 100, and we have the following buckets at different timestamps as shown below. Suppose that at times 101 through 105, 1's appears in the stream. Compute the set of buckets that would exist in the system at time 105. (4)

End Time	100	98	95	92	87	80	65
Size	1	1	2	2	4	8	8

- c. What is the function of a Bloom filter? (1)

5.

- a. Discuss about the characteristics of NoSQL Systems. (4)
- b. When converting a relational model to a graph model in Neo4j, what are the general guidelines that needs to be followed, with a simple example? (3)
- c. What is consistent hashing? (2)

Percentage Points of the Chi-Square Distribution

Degrees of Freedom	Probability of a larger value of χ^2								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21
11	3.053	4.575	5.578	7.584	10.341	13.70	17.28	19.68	24.72



National Institute of Technology, Tiruchirappalli – 15
Department of Computer Science & Engineering

Cycle Test – I

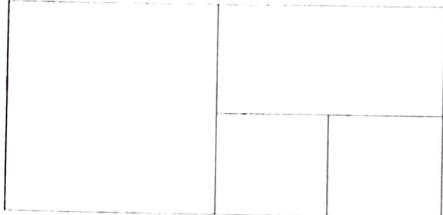
CSPE61 – Web Technology and its Applications (Program Elective)

Class / Semester : III CSE / VI Time : 3.30 PM to 4.30 PM
Date : 29.02.2024 Marks : 20

Answer all questions

1. Design a web page using HTML to divide the browser window using the concept of Frames as shown below that loads an image in each frame. (5)

(CO 1)



2. Convert the following XML document into an XHTML table using XSLT. (5)

(CO 1)

```
<? Xml version = "1.0" ?>
<Students>

    <Student rollno="CS101">
        <name>John</name>
        <department>CSE</department>
        <cgpa>9.5</cgpa>
    </Student>

    <Student rollno="EC107">
        <name>Rohit</name>
        <department>ECE</department>
        <cgpa>8.7</cgpa>
    </Student>

</Students>
```

3. Apply the following styles to a webpage using Embedded CSS. (5)
(CO 1)

- a. Set the webpage background color to Yellow.
- b. Set the color of the link as Red.
- c. Change the color of the visited link to Green and mark as Underlined.
- d. Set the color as Blue, size as 20 pt and type as Arial for a paragraph text.
- e. Highlight the first line in a paragraph with color as Red and big font-size.

4. Design a webpage using XHTML as shown below. (5)

(CO 2)

<u>EMPLOYEE DETAILS</u>	
Enter the Employee Name :	<input type="text"/>
Enter the Employee ID :	<input type="text"/>
Enter the Basic Salary :	<input type="text"/>
<input type="button" value="OK"/>	

Write a Java script program to retrieve the form's data and calculate the following.

DA = 46% of Basic Salary

HRA = 18% of Basic Salary

Gross Salary = Basic Salary + DA + HRA

Display the Gross salary in a dialog box, when the form's Submit button gets clicked.



National Institute of Technology, Tiruchirappalli – 15
Department of Computer Science & Engineering

Cycle Test – II

CSPE61 – Web Technology and its Applications (Program Elective)

Class / Semester : III CSE / VI Time : 3.30 PM to 4.30 PM
Date : 03.04.2024 Marks : 20

Answer all questions

1. Create a web page with two horizontal frames. Write a DHTML code to add a drop-down list of Fruits on the Upper frame. When the user clicks on an item in the list, the corresponding selected item will be displayed on the lower frame. (5)

[CO3]

2. Design an HTML Form that consists of the following Checkbox options and a SUBMIT button. (7)

Apple Orange Grapes Mango Lemon

Write a Servlet Program using Http Servlet to retrieve the selected options (use doPost() method) and display them in the Servlet window. [CO2]

3. Create a Three-Tier web application using Java Server Pages to retrieve the BOOK table (bid, bname, author, isbn, price) from SQL database via JDBC and display the retrieved table entries in the browser window. Also include options to insert, update and delete the database entries. (8)

[CO5]



National Institute of Technology, Tiruchirappalli – 15
Department of Computer Science & Engineering

End Semester Examination – MAY 2024
CSPE61 – Web Technology and its Applications (Program Elective)

Class / Semester : III CSE / VI Time : 2.00 PM to 5.00 PM
Date : 15.05.2024 Marks : 30

Answer all questions

1. Design a Marquee that scrolls the text “WELCOME” from right to left across the browser window. Set the background color to Marquee as RED and Text color as WHITE. Also set the background color to the Web page as BLUE. [CO1] (5)

2. Design an HTML Form that consists of the following fields and a SUBMIT button.

Emp Name	Emp ID	DOB
Department	Salary	Email ID

Write a Generic Java Servlet Program to retrieve all the Form Parameter Names and their corresponding values and display them in the Servlet window.

[CO2] (5)

3. Create a web page with two horizontal frames. Write a DHTML code to input an integer number dynamically from the user in the upper frame. The lower frame receives the integer number from the upper frame and prints the Hexa-Decimal equivalent of that number.

[CO3](6)

4. Create a Three-Tier web application using PHP to retrieve the STUDENT table (RollNo, Name, Branch, Semester, Cgpa) from SQL database using database connectivity and display the retrieved table entries in the browser window. Also include options to insert, update and delete the database entries. [CO4](8)

5. Write short notes on the following. [CO5] (3 + 3 = 6)

- a. MongoDB
 - b. Bootstrap
-

NIT Trichy CSE VIth Semester, 1st CT

Sub.Code: CSPC63

Title: Principle of Cryptography

Date:29-02-2024 Time:10:30 am to 11:30 am Max.Marks: 20

1. Alice wants to encrypt some sequence of independent decimal digits and send to Bob. Let E_K denote the encryption function operating on decimal digits. A sequence of decimal digits $M_1, M_2, \dots, M_n \in Z_{10}$ is encrypted to a sequence of ciphertext symbols $C_1, C_2, \dots, C_n \in Z_{10}$ by $C_i = E_K(M_i); \forall i; 1 \leq i \leq n : (M, K \in Z_{10})$ Prove or disprove that the following mapping is possible encryption function.
 $E_K(M) = M;$ [1.5]
2. Suppose E_1 and E_2 are two encryption methods. Let t_1 and t_2 be two keys belonging to Z_{26} . Define E_1 be an encryption, which involves multiplying the plaintext, m also belonging to Z_{26} by t_1 . Similarly, define E_2 as an encryption which involves adding the input with t_2 , modulo 26. Answer the following questions regarding the above ciphers and their composition:
 - i. What is the requirement of t_1 for the cipher E_1 to be an encryption algorithm?
 - ii. The composition of the ciphers, denoted by $E_1 \circ E_2$ is defined as $(E_1 \circ E_2)(m) = c = t_1 m + t_2 (\text{mod } 26)$. What is the brute force complexity to break the cipher
 - iii. Develop a meet in the middle attack against the composite cipher, and find the time complexity of this attack.
[5.5]
3. Prove or refute: perfect security of the following scheme. (Caesar cipher) Key: a random $k_1, k_2 \leftarrow_R Z_{26}$. Encrypt a length-2 string $x \in Z_{26}^2$ to the pair $x_1 + k_1 (\text{mod } 26), x_2 + k_2 (\text{mod } 26)$. [2]
4. Assume that the initial permutation S is randomly chosen from the set of all the possible permutations of $\{0, \dots, 255\}$. Then prove that the second output word of RC4 is 0 is approximately $2/256$. Note: You do not need to prove following lemma: if $S[2] = 0$ then 2nd output($Z[2]$) is zero. [2.5]
5. Briefly explain Shannon's diffusion and confusion principle. In AES, every round there is byte substitution. What will be substitution of the byte 00000100? Where irreducible polynomial is $x^8 + x^4 + x^3 + x + 1(100011011)$. [1.5+2]
6. Let (E, D) be a semantically secure cipher where the message and ciphertext space is $\{0, 1\}^n$. Prove or disprove that following scheme is semantically secure?
 - (i) $C = E'(k, m) = E(k, m) \oplus (11 \dots 11)$. (all one)
 - $D'(k, C) = D(k, C) \oplus (11 \dots 11)$. (all one)
[2.5]
7. Randomized (Polyalphabetic) symmetric encryption scheme:
 Shared Key: An odd prime integer p is the shared key between sender and receiver.
 Encrypt(p, m): To encrypt a bit $m \in \{0, 1\}$. Ciphertext $c = pq + m$, where the prime integer q is chosen at random.
 Decrypt(p, c): Output $(c \bmod p) \bmod 2$.
 Show that if Attacker knows some messages m (m is a bit either 0 or 1) of his choice and its corresponding ciphertext then he can find private key p . (in other words above symmetric cryptosystem is vulnerable under chosen message attack. He can ask ciphertext for same message twice)
 [2.5]

NIT Trichy CSE VIth Semester, Semester Exam

Sub.Code: CSP068

Title: Principle of Cryptography

Date: 14-05-2024 Time: 02:00 pm to 05:00 pm Max Marks: 100

1. (a) Suppose we are told that plaintext "Friday" yields the ciphertext "PQKKA" where Hill cipher is used ($m = 2$). Find the KEY. [8]
- (b) Prove or refute perfect security of the following scheme.
 Consider the cryptosystem with probability measures given as follows. Plaintext space $X = \{a, b, c\}$. Key space $K = \{K_1, K_2\}$. Ciphertext space $Y = \{1, 2, 3, 4\}$
 Encryptions functions are defined by:

$$\begin{pmatrix} a & b & c \\ k_1 & 1 & 2 & 3 \\ k_2 & 2 & 3 & 4 \end{pmatrix}$$
 Plaintext and key distributions are defined by:

$$\begin{pmatrix} a & b & c \\ 1/4 & 1/4 & 1/2 \end{pmatrix}$$
 Probability that plaintext equal to a is $1/4$, plaintexts equal to b is $1/4$ and plaintext equal to c is $1/2$

$$\begin{pmatrix} k_1 & k_2 \\ 1/4 & 3/4 \end{pmatrix}$$
 Probability that key equal to k_1 is $1/4$ and key is equal to k_2 is $3/4$. [8]
- (c) In AES, every round there is byte substitution. What will be substitution of the byte 00000100? Where irreducible polynomial is $x^8 + x^4 + x^3 + x + 1(100011011)$. Also what will be substitution of the byte 00000000? [8]
- (d) Explain the meet in middle attack on 2-DES. Find the memory and time complexity of this attack. [8]
2. (a) Find generator of Schnorr group for following prime $p = 11$. Also find other elements of the Schnorr group.
 $\therefore p = 11 = 2 * 5 + 1$ [4]
- (b) Solve following quadratic congruent equation (Do not use trial method).
 $(\exists y^2 \equiv 13 \pmod{17})$ [8]
- (c) Explain AES with CBC Mode of operation. Let m be a message consisting of l AES blocks (say $l = 100$). Alice encrypts using CBC mode and transmits the resulting ciphertext to Bob. Due to a network error, ciphertext block number 15 is corrupted during transmission. All other ciphertext blocks are transmitted and received correctly. Once Bob decrypts the received ciphertext, how many plaintext blocks will be corrupted? [2+8]
- (d) Find the minimum value of k (minimum no. of students) such that probability is greater than 0.5 that at least two people in a group of k -people have the same birthday? How it improves the attack on collision resistant property of the hash function. [8]
3. (a) For RSA with parameters: $e = 7$ and $n = 11 * 18$.
 - Encrypt the message block $M = 8$.
 - Compute a private key corresponding to the given above public key.
 - Perform the decryption of the obtained ciphertext using the method which is four times faster than usual method (Using CRT).

NIT Trichy CSE VIth Semester, Semester Exam
 Sub.Code: CSPC63 Title: Principle of Cryptography
 Date:14-05-2024 Time:02:00 pm to 05:00 pm Max.Marks: 100

1. (a) Suppose we are told that plaintext "friday" yields the ciphertext "pqcfku" where Hill cipher is used ($m = 2$). Find the KEY. [4]

- (b) Prove or refute: perfect security of the following scheme.

Consider the cryptosystem with probability measures given as follows: Plaintext space $X = \{a, b, c\}$, Key space $K = \{K_1, K_2\}$, Ciphertext space $Y = \{1, 2, 3, 4\}$

Encryption functions are defined by:

$$\begin{pmatrix} a & b & c \\ k_1 & 1 & 2 & 3 \\ k_2 & 2 & 3 & 4 \end{pmatrix}$$

Plaintext and key distributions are defined by:

$\begin{pmatrix} a & b & c \\ 1/4 & 1/4 & 1/2 \end{pmatrix}$ Probability that plaintext equal to a is $1/4$, plaintext equal to b is $1/4$ and plaintext equal to c is $1/2$

$\begin{pmatrix} k_1 & k_2 \\ 1/4 & 3/4 \end{pmatrix}$ Probability that key equal to k_1 is $1/4$ and key is equal to k_2 is $3/4$. [4]

- (c) In AES, every round there is byte substitution. What will be substitution of the byte 00000100? Where irreducible polynomial is $x^8 + x^4 + x^3 + x + 1(100011011)$. Also what will be substitution of the byte 00000000? [5]

- (d) Explain the meet in middle attack on 2-DES. Find the mememory and time complexity of this attack. [5]

2. (a) Find generator of Schnorr group for following prime $p = 11$. Also find other elements of the Schnorr group.

$$(i) p = 11 = 2 * 5 + 1 [4]$$

- (b) Solve following quadratic congruent equation (Do not use trial method).

$$(i) b^2 \equiv 13 \pmod{17} [5]$$

- (c) Explain AES with CBC Mode of operation. Let m be a message consisting of l AES blocks (say $l = 100$). Alice encrypts using CBC mode and transmits the resulting ciphertext to Bob. Due to a network error, ciphertext block number 15 is corrupted during transmission. All other ciphertext blocks are transmitted and received correctly. Once Bob decrypts the received ciphertext, how many plaintext blocks will be corrupted? [2+3]

- (d) Find the minimum value of k (minimum no. of students) such that probability is greater than 0.5 that at least two people in a group of k -people have the same birthday? How it improves the attack on collision resistant property of the hash function. [5]

3. (a) For RSA with parameters: $e = 7$ and $n = 11 * 13$.

i. Encrypt the message block $M = 3$.

ii. Compute a private key corresponding to the given above public key.

iii. Perform the decryption of the obtained ciphertext using the method which is four times faster than usual method(Using CRT).

NATIONAL INSTITUTE OF TECHNOLOGY TRICHY 15
PROFESSIONAL ETHICS FOR ENGINEERS
DEPARTMENT OF COMPUTER SCIENCE ENGINEERING
(CT1)

29.02.2024

TIME = 1 HOUR

ATTEND ALL THE QUESTIONS. ALL ARE COMPULSORY

1 TO 5 CARRIES 2 Marks each

6 & 7 CARRIERS 5 Marks each

1. What is Work Ethics?
2. What is meant by Act Utilitarianism?
3. Explain the concept Civic Virtue and write two civic virtues?
4. Write any two criteria required for a Profession.
5. What are the uses Of Ethical Theories?
6. List out the logical steps in confronting Moral Dilemma?
7. What is Honesty?

NATIONAL INSTITUTE OF TECHNOLOGY TRICHY 15.
PROFESSIONAL ETHICS FOR ENGINEERS
DEPARTMENT OF COMPUTER SCIENCE ENGINEERING
(Semester)

18.05.2024

TIME = 2 HOUR

TOTAL MARKS = 40

Answer all the questions. Each question carries 5 marks.

1. What are the Ethical problems initiated by computers in the work place?
2. Who is an Expert witness and how are they being misused?
3. What is Collective Bargaining and its objectives?
4. Describe in detail about Risk Benefit Analysis.
5. Explain Lawrence Kohlberg's Theory of Moral Development?
6. Write the Code for Builders by Hammurabi.
7. What is Intellectual Property rights and what are the problem faced while adopting it?
8. What are the characteristics of Engineers as Managers?



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
Department Of Computer Science And Engineering

First Class Test on
Compiler Design

Marks: 15

Course Code: CSPC62

Time: 1hr

Instructions to the Students: Answer all questions.

1. Write a regular definition of comments consisting of a string surrounded by /* and */. without any intermediate */ unless it is inside double-quotes (""). Draw the corresponding transition diagram. [1+1]
2. Consider the following grammar:

$$M \rightarrow R + R \mid R + c \mid R$$

$$R \rightarrow c$$

- a. Design a LL(1) parser for this grammar. Is there any conflicts? [4+1]
- b. Design the set of LR(1) items for this grammar. [3]
- c. Create a canonical LR parser for this grammar and show parsing steps for input: c+c [3+2]



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
Department Of Computer Science And Engineering

Final Assessment on

Compiler Design

Marks: 100

Course Code: CSPC62

Time: 3hrs

Instructions to the Students: Answer all questions.

- What are the advantages of (a) a compiler over an interpreter (b) an interpreter over a compiler? c) What advantages are there to a language-processing system in which the compiler produces assembly language rather than machine language? [2.5+2.5+3]
- Divide the following program into appropriate lexemes.

```
float limitedSquare(x) {  
    /* returns x-squared, but never more than 100 */  
    return (x<=-10.01 || x>=10.0) ? 100 : x*x;  
}
```

Which lexemes should get associated lexical values and what? [3+2]

- Suppose we have two tokens: (1) the keyword **if**, and (2) identifiers, which are strings of letters other than **if**. Show the NFA for these tokens. [5]
- a) What are the features of an LL(1) grammar? Explain.
b) Write a grammar for arithmetic expressions from the following associativity and precedence of operators. Operators on the same line have the same associativity and precedence:

Precedence Order	Operators	Associativity
1	$^$	left
2	$\%$	right
3	$*$	left
4	$+, -$	left

- c) Is this grammar an LL(1) grammar? If not, convert it to construct a non-recursive predictive parser for the grammar.
d) Use the idea of synch on Follow sets to convert the parser into error-correcting mode.
e) Show the parsing steps for the input **id** $^$ **id** $*$ **+id**. [3+4+5+3+3]
- Consider the following grammar. Is this grammar suitable for LALR(1) parser? If yes, build the parser. [1+8]

$$\begin{array}{l} S \rightarrow L = R \mid R \\ L \rightarrow *R \mid id \\ R \rightarrow L \end{array}$$

- a) Define with example L-attributed SDD and S-attributed SDD.

The following grammar generates binary numbers with a "decimal" point:

$$\begin{array}{l} S \rightarrow L . L \mid L \\ L \rightarrow L B \mid B \\ B \rightarrow 0 \mid 1 \end{array}$$



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- b) Design an L-attributed SDD to compute **S.val**, the decimal-number value of an input string. Hint: use an inherited attribute **L.side** that tells which side of the decimal point a bit is on. c) Design an S-attributed SDD for this grammar. [4+4+3]
7. a) Construct the DAG for the expression $((x + y) - ((x+y) * (x-y))) + ((x+y) * (x - y))$.
b) Show the three-address code for this with minimum number of temporary variables. [3 + 3]
8. Consider the following statement **if (x<100 && x!=y || y>200)**
a) Write syntax-directed definition for implementing the three-address code for the control-flow. b) Generate the code. [5+4]
9. What is an activation tree? How is it different from activation records? Draw the activation tree of the following program with initial call **f(5)**: [2+2+5]
- ```
int f(int n) {
 int t, s;
 if (n < 2) return 1;
 s = f(n-1);
 t = f(n-2);
 return s+t;
}
```
10. What is a leader in code optimization? Consider the following block of code:
- 1) i = 1
  - 2) j = 1
  - 3) t1 = 10 \* i
  - 4) t2 = t1 + j
  - 5) t3 = 8 \* t2
  - 6) t4 = t3 - 88
  - 7) a[t4] = 0.0
  - 8) j = j + 1
  - 9) if j <= 10 goto (3)
  - 10) i = i + 1
  - 11) if i <= 10 goto (2)
  - 12) i = 1
  - 13) t5 = i - 1
  - 14) t6 = 88 \* t5
  - 15) a[t6] = 1.0
  - 16) i = i + 1
  - 17) if i <= 10 goto (13)
- a) What is the purpose of this code? b) Create the flow graph for this code. c) Apply code optimization techniques over this flow graph. Count the amount of savings after every step. d) What is peephole optimization? Describe. e) Can you save more over this code if you apply peephole optimization? Give reasons for your answer. [2+2+6+4+2]
11. What is the role of the **getReg()** function in code-generation? Describe. [4]



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING  
B.TECH. VI-SEMESTER :: CYCLE TEST I  
CSPC61- EMBEDDED SYSTEMS ARCHITECTURES

Course/ Branch/Section: B. Tech/ CSE/A  
Max. Marks: 20

Date: 28.02.2024  
Duration: 1 hour

Answer All Questions

1. a) Explain the role of an embedded system in contemporary vehicles that enhances safety during braking. Elaborate on how this system utilizes sensors to prevent wheel lock-up and improve overall vehicle control. [1 M]
  
- b) List any four application layer protocols found in an embedded system model. [1 M]
  
- c) Name and describe the various architectural structures commonly employed in embedded systems. [1 M]
  
2. a) Is firmware and data embedded in microcontrollers generally safe from tampering, downloading, or hacking? [2M]
  
- b) Identify and provide descriptions for four distinct embedded systems utilized in daily life. [2M]
  
- c) Name six challenges commonly faced when designing embedded systems. [2M]
  
- d) Discuss the influence of memory on the performance of an embedded system. [2M]
  
3. a) Discuss the different models of Instruction Set Architecture (ISA) utilized in the context of embedded systems with neat diagrams. [3M]
  
- b) Contrast Von Neumann and Harvard Architectures, incorporating clear diagrams to illustrate the distinctive features of each design. [3M]
  
- c) What is the difference between UART, SPI, and I2C? [3M]

\*\*\*\*\*Best Wishes\*\*\*\*\*



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING  
B.TECH. VI-SEMESTER :: END-SEMESTER EXAMINATION  
CSPC61- EMBEDDED SYSTEMS ARCHITECTURES

Course/ Branch/Section: B. Tech/ CSE/A  
Max. Marks: 50

Date: 16.05.2024  
Duration: 3 hours

Answer All Questions

1. a) Discuss the classification of embedded systems with real-time applications. [4]  
b) Given the architecture of an embedded model, how do you identify whether it belongs to the von Neuman model or the Harvard model? [3]  
c) Name and describe two types of ISAs that fall under each of the three most common ISA models. Give three real-world processors that fall under the types of ISAs. [2]
  
2. a) Explain the architecture of any one embedded processor with a neat diagram. [4]  
b) What is the difference between UART, SPI, and I2C? [3]  
c) Explain the current trends and challenges in the field of embedded systems. [2]
  
3. a) Discuss different device drivers software used in embedded systems. [4]  
b) What are the solutions to improve the board's memory and performance? [3]  
c) State the purpose of I/O on a board. List five categories of board I/O, with two real-world examples under each category. [2]
  
4. a) Name and describe the four subcomponents that make up PPP software. What is the difference between a PPP state and a PPP event? [4]  
b) Demonstrate Earliest Deadline First (EDF) scheduling with a clock-driven approach using clear diagrams. [3]  
c) Write an Embedded C program to display a LED message representing "NITT CSE". [3]
  
5. a) Discuss the different stages involved in creating an embedded systems architecture. [5]  
b) Write short notes on embedded system GPU Design. [3]  
c) Design an embedded system for a smart home security system using a microcontroller. The system should be able to detect motion using passive infrared (PIR) sensors and send real-time alerts to the homeowner's smartphone. Discuss the key components of the system, including the choice of microcontroller, communication protocols, power management, and security measures. Explain how you would optimize the system for low power consumption while ensuring reliable operation and data integrity. [5]

\*\*\*\*\*Best Wishes\*\*\*\*\*