Shahjalal University of Science and Technology
Institute of Information and Communication Technology
Software Engineering
Final Examination, 1st Year 2nd Semester, 2020
Course No: SWE-127 Course Title: Data Structure
Credits: 3 Full Marks: 30 Time: 12 Hours

Group A

[Answer all the questions]

1. **2x2.5=5**

a) Suppose S= 'WE THE PEOPLE' and T= 'OF THE UNITED STATES' contains the text

i. INSERT(S , 3, 'xyz') and INSERT(T , 3, 'xyz')
ii. DELETE(S, 1 , 3) and DELETE(T , 1 , 7)
iii. INDEX(S , 'E') and INDEX(T , 'THE')
iv. SUBSTRING(S , 4 , 8) and SUBSTRING(T , 10 , 5)
v. REPLACE(S , 'WE' , 'ALL') and REPLACE(T , 'THE' , 'THESE')

b) Generate a binary search tree with the following data:
12, 34, 2, 1, 13, 14, 4
Now delete the root and regenerate the whole tree.

2. Suppose that the following characters are given with their corresponding frequency (In Thousand): e:9 f:5 d:16 a:45 c:12 b:13 **1*10=10**
Using Huffman's algorithm, find the code for each character.

Group B

[Answer all the questions]

1. **Answer all the question** **2x2.5=5**

a) What is complexity of algorithm? Rank the complexities:n, nlogn, 2^n, n^3, n^2, 2^n
Describe Time Space Tradeoff with a real example.

b) Consider the following queue where QUEUE is allocated 6 memory cells(0-based indexing):
FRONT = 1, REAR = 4, QUEUE:_____, London, Berlin, Rome, Paris, _____
Describe the queue, including FRONT and REAR, as the following operations take place:

i. Athens is added
ii. Madrid is added
iii. Moscow is added
iv. Two cities are deleted
v. Oslo is added
vi. Six cities are deleted

2. Build a Minimum Heap tree for the given numbers: (Show each step) **1x10=10**
D, A, T, A, S, T, R, U, C, T, U, R, E, S

Shahjalal University of Science and Technology
Institute of Information and Communication Technology
Software Engineering
Final Examination, 1st Year 2nd Semester, 2020
Course No: SWE-125 Course Title: Introduction to Software Engineering
Credits: 3 Full Marks: 30

Group A

[Answer all the questions]

1.	Why does it take so long to get software finished? Explain the failure curve for software.	**5**
2.	What are the roles of a software manager? Explain.	**5**
3.	Explain spiral model with proper diagram.	**5**

Group B

[Answer all the questions]

4.	What is software testing? Write short notes on Unit testing.	**5**
5.	What is a software process? What are some generic process models?	**5**
6.	What are functional and non functional requirements? Explain with examples.	**5**

Shahjalal University of Science and Technology
Institute of Information and Communication Technology
1st Year 2nd Semester Final Exam 2020
Course Code: MAT 107W
Course Title: Linear and Abstract Algebra
Marks: 20

Group A

1. **2**

a) Let $X = \begin{bmatrix} x & -x & 4 \\ x & 3 & -x \\ 6 & -3x & -5 \end{bmatrix}$, where x is any real number. Find the matrices Y and Z such that X = Y + Z, where Y is symmetric and Z is skew symmetric.

b) Consider the matrix **3**

$$A = \begin{pmatrix} 1 & 0 & 0 & 3 \\ 2 & -1 & 0 & 6 \\ 0 & 2 & 3 & 0 \\ -3 & 3 & 0 & 5 \end{pmatrix}$$

i. Transform A to an equivalent lower triangular Matrix B
ii. By using (i) find |A|, the determinant of A
iii. Hence find $|A^T|$
iv. Find $|A^{-1}|$, the determinant of the inverse of A

2. a) Test the consistency of the system of equations: **2**

$$x + y - z = 0$$
$$2x - 3y + z = -1$$
$$x - 2y - 2z = 1$$

b) Define the rank of a matrix. Find the rank of the following matrix. **3**

$$M = \begin{bmatrix} 2 & -1 & -1 & 3 \\ 4 & -3 & -1 & 1 \\ 6 & -2 & -1 & -1 \\ 2 & -1 & 2 & -12 \end{bmatrix}$$

Group B

3. a) Find the eigen values and corresponding eigen vectors of the following matrix **3**

$$Q = \begin{bmatrix} 1 & 1 & 2 \\ -1 & 2 & 1 \\ 0 & 1 & 3 \end{bmatrix}$$

b) Let the linear transformation $L: \mathrm{R}^3 \to \mathrm{R}^4$ be determined by **2**

$$L\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} x+y \\ x-y \\ z \\ x \end{bmatrix}, \forall\, x, y, z \in \mathbb{R}$$

Find the transformation matrix [L] with respect to the bases

$$\mathrm{S} = \left\{\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}\right\} \text{ and } T = \left\{\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \\ 0 \end{bmatrix}\right\}$$

4. a) Define order of an element in a group. Prove that the order of an element and that of its inverse are the same in a group. **3**

b) Find all the generators of $< \mathrm{Z}_6; + >$ **2**

Shahjalal University of Science and Technology
Institute of Information and Communication Technology
1st Year 2nd Semester Final Exam 2020
Course Code: STA 101W
Course Title: Basic Statistics and Probability
Marks: 30

Group A

[Answer all the questions]

1. Explain the concepts: (i) Population, (ii) Sample (iii) Variable, (iv) Primary data, (v) Frequency distribution, and (vi) Graphical representation of data. **5**

2. **a)** What is a measure of dispersion and why do you need such a measure at all? What are the important measures of dispersion? **2**

b) Show that the variance of first n-natural number is $\frac{n^2-1}{12}$. **3**

3. **a)** Distinguish between positive and negative correlation. Name the various measures of correlation. **3**

b) What is regression? Write down the objectives of regression analysis. **2**

Group B

[Answer all the questions]

4. A coin is tossed three times. Write down the sample space. Find the probability of (i) exactly two heads (ii) at least two heads (iii) no head. **5**

5. **a)** Explain the concept (i) random variable (ii) mathematical expectation of a random variable. **2**

b) A coin is tossed two times in which the probability of head is twice as the probability of tail. If the number of head is random variable, say X, find the probability function of X. **3**

6. **a)** What are the conditions that a binomial variate must satisfy? **2**

b) Write the form of binomial distribution for which the mean is 4 and standard deviation is $\sqrt{3}$. Under what condition binomial distribution tends to Poisson distribution. **3**

Shahjalal University of Science and Technology
Institute of Information and Communication Technology
BSc (Engg.) in Software Engineering 1st year 2nd Semester Final Exam, 2020
Course: SOC 203W (Sociology for Engineers)

Marks: 30; Credit: 3.0

[**Answer all the questions**]

PART A

Q.1.	Define Sociology.	3
Q.2.	Briefly outline the various steps of a scientific research with suitable examples.	6
Q.3.	Do you notice any changes in the traditional functions of family? Discuss.	6

PART B

Q.4.	How do you define socialization?	3
Q.5.	Discuss the elements of culture with examples from your own society and experience.	6
Q.6.	Illustrate the various types of social stratification with suitable examples.	6