UNIVERSITY OF THE PUNJAB

B.S. Computer Science 2nd Year : Annual – 2021

Subject: Discrete Mathematics

Paper: 6

Roll No. in Fig. ....

Roll No. in Words. ....

....

....

Signature of Supdt.:

Time: 30 Min. Marks: 20

Attempt this Paper on this Question Sheet only.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer cutting and overwriting is not allowed.   **(10x2=20)**

1. "Some students want to pursue Engineering and some want to excel in Medical Sciences." Which of the following quantified expression can best represent the statement?
   a) $\exists n \wedge \forall x$ b) $\exists n \exists x$ c) $\exists n \vee \exists x$ d) $\exists n \wedge \exists n$

2. The total degree of undirected graph will always be?
   a) Positive   b) Even   c) Odd   d) None of the mentioned
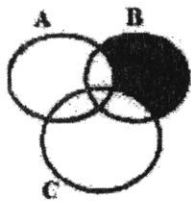
3. Euler path within a graph can be determined by means of?
   a) Edge   b) Degree   c) Vertex   d) None of the mentioned

4. If a compound Proposition statement is made up of four propositions, then the number of distinct combinations in the truth table will be:
   a) 8   b)16   c) 32   d) 64

5. The shaded area of figure is best described by:

   a) $A - B - C$ b) $B - A - C$
   c) $C \cup A$ d) $C \cap A$

6. The expression $\lfloor 4.7 \rfloor + \lceil 3.1 \rceil + \lceil -3.9 \rceil + \lfloor -2.87 \rfloor$ evaluates to:
   a) 1   b) 2   c) 3   d) 4

7. If we have to ensure that at least five of the students have similar grade in a course (where total possible grades are 7), minimum number of students should be?
   a) 12   b) 29   c) 25   d) 35

8. The total number of edges in n-cube graph Q_2 will be?
   a) 2   b) 4   c) 6   d) 8

9. $f(n) = -99n^5 + 87n^4 - 9n^2$ is:

   a) $O(n^3)$ b) $O(n^5)$ c) $O(n^6)$ d) Both a and b   e) Both b and c   f) None

10. Is the relation R defined by "R = {(2,1),(1,2),(1,3),(2,2), (1,1), (3,2)}" reflexive?
    a) Yes   b) No   c) More information needed   d) None of the mentioned

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Answer the following questions. Attempt all questions.

1. Answer each of the following questions: **[17 marks]**
    a. Translate following quantified expression.   **[2 marks]**
    $$\forall x \forall y\, ((x < 0) \wedge (y < 0) \to (xy > 0))$$
    b. Assume $P(x,y)$ is $(x = y - 5)$. Determine the value of $\exists y \forall x\, P(x,y), \forall x \exists y\, P(x,y)$ $[x, y \in \mathbb{R}]$.   **[4 marks]**
    c. Assume $P(x,y)$ is $(2x > (y - 2))$. Write both $\exists y \forall x\, P(x,y), \forall x \exists y\, P(x,y)$ in expanded form and determine their truth value, where $[x, y \in$ set of first four natural numbers].   **[8 marks]**
    d. Write down the contrapositive, inverse and converse for the statement:
        "If it is not humid today, then the even gathering will take place."   **[3 marks]**

2. Answer each of the following questions: **[18 marks]**
    a. What is the least common multiple and greatest common divisor of $3^3 4^5 7^2$ and $2^4 3^3 7^3$? Apply Number Theory rules to solve.   **[3 marks]**
    b. Let A be the set $\{2,4,7,9,11,18\}$. Which ordered pairs are in the relation $R_1 = \{(a, b) \mid a$ divides $b\}$ and $R_2 = \{(a, b) \mid b$ divides $a\}$?   **[4 marks]**
    c. Prove the statement: If x is an integer and $7x + 2$ is odd, then x is odd.   **[4 marks]**
    d. Proof the following using mathematical induction.   **[7 marks]**
    $$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + \cdots + n^3 = \left(\frac{n(n + 1)}{2}\right)^2$$

3. Answer the following: **[18 marks]**
    a. Evaluate following summations using n=5, m = 3, a= 8 and b= -5   **[6 marks]**
    $$\sum_{j=1}^{m}\sum_{i=1}^{n} i^2 + 5bj - 8ai$$
    b. Evaluate following summations by using formulas: **[4 marks]**
 $$\sum_{k=42}^{99} k \text{ where } \sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$
    c. For A = $\{1,2,3,4,6\}$ B=$\{2,1,7,9\}$ and universal set being first ten natural numbers. Express Set A and B in form of bitstrings. Also compute AUB, A-B, B-A and A∩B, and express the results using set-representation, bitstrings and vein diagrams.   **[2+3+3=8 marks]**

4. Represent the following two graphs using Adjacency matrix and Incidence matrix. Also determine that whether the given undirected graph has Hamiltonian circuit/Hamiltonian path, Euler circuit/Euler path. Also determine the chromatic number for the undirected graph.   **[2 + 2+ 3+3+3 = 13 marks]**
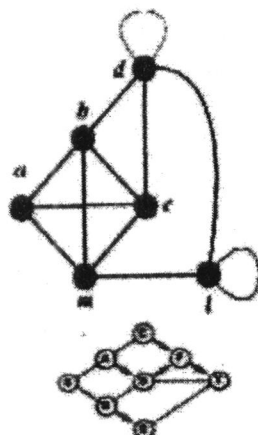
5. What is the next term in the sequence: $\{6,28,138,688,3438,.....\}$ **[6 marks]**
    Express above sequence using recurrence relations. Also clearly write initial value(s).

6. In a programming language: variable names up to four-length are accepted. These variable names can start with a lowercase or uppercase English letter or four special-characters. However, for the remaining three letters, digits and seven-special characters are also allowed. Out of the total possible combinations: nine (9) single-length, nineteen(19) two-length, and forty-three (43) three-length variable names are reserved words. How many different variable names can be made in this language, excluding the reserved words?   **[8 marks]**

UNIVERSITY OF THE PUNJAB

B.S. Computer Science 2nd Year : Annual – 2021

Subject: Object Oriented Programming & Data Structures and Algorithms   Paper: 7   Time: 30 Min. Marks: 14

Roll No. in Fig. ....

Roll No. in Words. ....

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Signature of Supdt.:

Attempt this Paper on this Question Sheet only.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

[14 marks] Question 1: Choose the correct option.

1. Convert the following Infix expression to Postfix form using a stack.
   x + y * z + (p * q + r) * s, Follow usual precedence rule and assume that the expression is legal.
   a) xyz*+pq*r+s*+
   b) xyz*+pq*r+s+*
   c) xyz+*pq*r+s*+
   d) xyzp+**qr+s*+

2. Assume that the operators +,-, X are left associative and ^ is right associative. The order of precedence (from highest to lowest) is ^, X, +, -. The postfix expression for the infix expression a + b X c – d ^ e ^ f is?
   a) abc X+ def ^^ –
   b) abc X+ de^f^ –
   c) ab+c Xd – e ^f^
   d) -+aXbc^ ^def

3. What is the output of following function for start pointing to first node of following linked list?

   1->2->3->4->5->6
   ```
   void fun(struct node* start)
   {
     if(start == NULL)
          return;
     printf("%d ", start->data);
     if(start->next != NULL )
          fun(start->next->next);
     printf("%d ", start->data);
   }
   ```
   a) 1 4 6 6 4 1
   b) 1 3 5 1 3 5
   c) 1 2 3 5
   d) 1 3 5 5 3 1

4. What do you call the selected keys in the quick sort method?
   a) Outer key
   b) Inner Key
   c) Partition key
   d) Pivot key
   e) Recombine key

5. Why we need to a binary tree which is height balanced?
   a) to avoid formation of skew trees
   b) to save memory
   c) to attain faster memory access
   d) to simplify storing

6. In which case adjacency list is preferred in front of an adjacency matrix?
   a) Dense graph
   b) Sparse graph
   c) Adjacency list is always preferred
   d) Complete graph

7. Which of the following is true?
   a) A graph may contain no edges and many vertices
   b) A graph may contain many edges and no vertices
   c) A graph may contain no edges and no vertices
   d) A graph may contain no vertices and many edges

8. Consider the following code. Can we access derived2() using the sptr pointer

```cpp
#include<iostream>
using namespace std;
class Ancestor
{
        private:
                void base1();
        protected:
                void base2();
        public:
                void base3();
};
class Successor: public Ancestor
{
        private:
                void derived1();
        protected:
                void derived2();
        public:
                void derived3();
};
void main()
{
        Successor* sptr = new Successor();
}
```

a) No
b) Yes

9. If a base class B is inherited from another class A and then a class C inherits from class B, which inheritance is shown?
   a) Multiple
   b) Single
   c) Double
   d) Multi-level

10. In private inheritance, the public members of the Base class are accessible in the Derived class as
   a) public members
   b) protected members
   c) private members
   d) No, they are not accessible

11. Which of the following statements are incorrect?

   a) a static field can be accessed with an object and also without one
   b) A static function is one you can use with or without a declared object.
   c) When an object uses a static function, the function receives a pointer to the object
   d) All of the above are correct

12. A friend class can access _____ members of other class in which it is declared as friend
   a) private
   b) protected
   c) public
   d) Both protected and private

13. A relationship in which lifetime of part depends on whole's lifetime:
   a) Composition
   b) Aggregation
   c) Both aggregation and composition
   d) Inheritance

14. We cannot make an instance of an abstract base class
   a) TRUE
   b) FALSE
   c) Can be true and false
   d) Can not say

UNIVERSITY OF THE PUNJAB
B.S. Computer Science 2nd Year : Annual – 2021

Roll No. ....

Subject: Object Oriented Programming & Data Structures and Algorithms

Time: 2 Hrs. 30 Min.   Marks: 61

Paper: 7

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

NOTE: Attempt ALL questions.

[2x5=10 marks] Question 2: What will be the output of the following program.

1. What will be the output of the following?

```cpp
#include<iostream>
using namespace std;
class Demo
{
public:
        Demo* FUN1()
        {
                cout << 1; return this;
        }
        Demo* FUN2()
        {
                cout << 2; return this;
        }

        Demo* FUN3()
        {
                cout << 3; return this;
        }
};
int main()
{
        Demo ob;
        ob.FUN1()->FUN2()->FUN3();
        return 0;
}
```

2. Assume you have 3,22,1,25,355,3,7,8,99,0 in "file.txt". What will be the output?

```cpp
#include<iostream>
#include<fstream>
#include<string>
using namespace std;
int main()
{
        fstream file;
        string x;
        file.open("file.txt", ios::in);
        file.seekg(3);
        getline(file, x, ',');
        cout << x << endl;
}
```

[5 marks] Question 3: Complete the following code.

```cpp
#include<iostream>
#include<string>
using namespace std;
class Employee
{
        //provide declaration of + operator function
private:
        int idNum;
        double salary;
public:
        Employee(int, double);
};
Employee::Employee(int id, double sal)
{
        idNum = id;
        salary = sal;
}
//provide definition of + operator function
int main()
{
        Employee oneEmp(1234, 14.55);
        double newSalary = 2.33 + oneEmp;
        cout << "New salary will be $" << newSalary << endl;
        return 0;
}
```

P.T.O.

[6 marks] Question 4

Create a class Matrix in C++ having a 2-D integer array mat[3][3] as data member (declare it as dynamic). Overload the following binary and unary operators for objects m1 and m2 of this class.

1. m1 + m2
2. m1 - m2
3. m1 * m2 (multiplication of two matrices)
4. m1 * num (num is a scalar)

[5x2=10 marks] Question 5:

(a) You have a circular queue with a capacity of 8 elements. Show what the contents of the array will be after the specified sequence of enqueue and dequeue operations, and show where the front and back indices will point. If an array entry is empty, either because it has never been filled, or because its value has been dequeued, then leave its box blank.

enqueue(6);
enqueue(5);
enqueue(3);
enqueue(2);
dequeue();

dequeue();

(b) Now you receive the following *additional* set of enqeueue and dequeue operations. Show the contents of the array and where the front and back pointers point after these additional operations have been applied to the queue (i.e., do not start from scratch but build on the queue that you started in the previous part).

enqueue(7);
enqueue(8);
enqueue(2);
enqueue(11);
dequeue();
dequeue();
enqueue(9);

[2x4=8 marks] Question 6

(a) Give the Inorder, Postorder and Preorder traversals of the following binary tree.
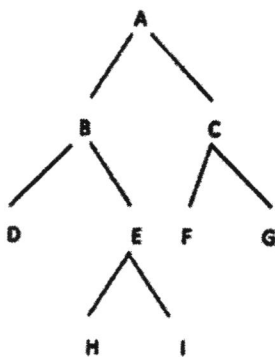
(d) The picture below represents a binary search tree. The numbers shown are arbitrary node labels, not numbers representing the contents of the nodes. The contents are not shown. If node 1 is deleted, using binary search tree deletion, what will be the new root node?

P.T.O.
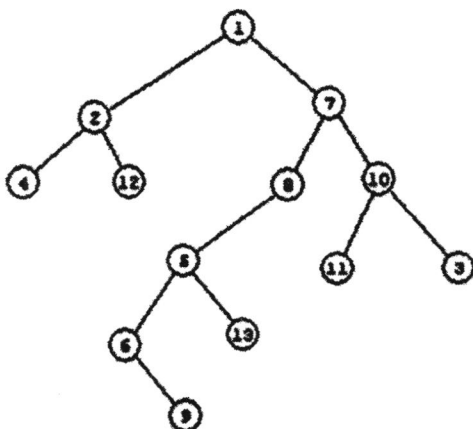
Consider the graph below. Unless otherwise indicated, always visit adjacent nodes in alphabetical order.
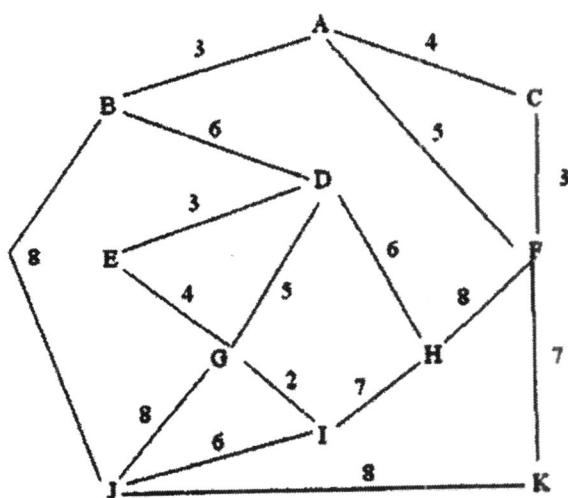
(a) Provide the DFS tree starting at node H.

(b) Provide the BFS tree starting at node H

[4x3=12 marks] Question 8

a) Consider the following array: 50, 23, 9, 18, 61, 32. Apply quicksort algorithm and show complete steps.

b) Suppose the following operations are performed on an empty stack. Insert numbers in the diagram to show what will be stored in the stack after the operations have executed (label the top):

   push(3); push(5); push(9); pop(); push(2); pop(); push(0);

c) Draw the binary min heap that results from inserting 11, 3, 2, 15, 4, 25, 6, 8, 1 in that order into an initially empty binary heap. Show all the intermediate steps.

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UNIVERSITY OF THE PUNJAB

B.S. Computer Science 2nd Year : Annual – 2021

Subject: Communication Skills & Technical and
Business Writing   Paper: 8   Time: 30 Min. Marks: 20

Roll No. in Fig. ....

Roll No. in Words. ....

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Signature of Supdt.:

Attempt this Paper on this Question Sheet only.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. a)   Choose the correct word.   **(4)**

i.   The neighborhood isn't very interesting. I like the house, _____.
a)   moreover   b)   thus   c)   though

ii. We live in the same building; _____, we hardly see each other.
a)   however   b)   therefore   c)   furthermore

iii. He didn't earn enough money _____, his wife decided to get a job.
a)   Moreover   b)   Therefore   c)   Although

iv. That house isn't big enough for us, and _____, it's too expensive.
a)   furthermore   b)   hence   c)   although

Q.1. b)   Complete the following sentences with an appropriate participle.   **(6)**

i.   His _____ coat needs mending.
a)   tattered   b)   tattering

ii. A _____ stone gathers no moss.
a)   rolling   b)   rolled

iii. A _____ opportunity never returns.
a)   losing   b)   lost

iv. He kept me _____
a)   waiting   b)   waited

v.   She looked _____
a)   worried   b)   worrying

vi. I saw the storm _____
a)   approaching   b)   approached

Q.1. c)   Confusing words   **(5)**

i.   I'm tired, so I'm going to sleep late in the morning _____, tomorrow is a holiday.
a)   Beside   b)   Besides

ii. Many medications have other _____ besides the intended one.
a)   affects   b)   effects

iii. _____ the cloth over the table, and then set the vase of flowers on it.
a)   Lay   b)   Lie

iv. My great-grandparents from Ireland in the 1840s.
a)   emigrated   b)   immigrated

v.   _____ up to you.
a)   Its   b)   It's

Q.1. d)   Punctuation   **(5)**

i.   Choose the correct sentence.
a)   My Grandmother lives on Fillmore Street.
b)   My Grandmother lives on Fillmore street.
c)   My grandmother lives on Fillmore street.
d)   My grandmother lives on Fillmore Street.

ii. Choose the correct sentence.
a)   Carmen said, "She said, "I'll never leave you."
b)   Carmen said, "She said, 'I'll never leave you."

iii. Choose the correct sentence.
a)   You certainly have a go get it nature.
b)   You certainly have a go-get-it nature.

iv. Choose the correct sentence.
a)   Hey, watch out for that car?
b)   Hey, watch out for that car!.
c)   Hey, watch out for that car!

v.   Choose the correct sentence.
a)   The women's dresses are on the second floor.
b)   The womens dresses are on the second floor.
c)   The womens' dresses are on the second floor.

UNIVERSITY OF THE PUNJAB

B.S. Computer Science 2ⁿᵈ Year : Annual – 2021

Roll No. ....

Subject: Communication Skills & Technical and Business Writing
Paper: 8

Time: 2 Hrs. 30 Min.   Marks: 80

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

NOTE: Attempt any FOUR questions. All questions carry equal marks.

Q2. Reading Comprehension: Read the passage. Then answer the questions below.

For two months, I have been trying to decide who makes the best ice cream. I have narrowed it down to my four favorite manufacturers: Randolph Farms, Goodies, Disco, and Twinkle.

Let's start with Randolph Farms. Randolph Farms makes very good ice cream. They have lots of different flavors, but this doesn't really matter to me. That's because I always get coffee flavor. They make the best coffee ice cream in the world. I've never had hot coffee (the drink) but people tell me that Randolph Farms coffee ice cream tastes just like the real thing. Also, Randolph Farms uses all natural ingredients to make their ice cream. This is a good idea, I think.

Second, we have Goodies. Goodies makes excellent ice cream. Like Randolph Farms, Goodies uses all natural ingredients. They only make three different flavors—strawberry, vanilla, and chocolate—but they make them very well. The strawberry is amazing. Every bite of it reminds me of the strawberries that I used to pick behind my old house. The vanilla is wonderful. It is very smooth and has a refreshing, creamy taste. The chocolate is outstanding. It is made with real cocoa beans from Bolivia. I didn't know where Bolivia is so I decided to look for it on a map. After hunting awhile, I discovered that it is in South America! That's a long way to go to get cocoa, so it must be good. I would say that the only drawback to Goodies ice cream is that they only make three different flavors.

Third, we have Disco. Disco ice cream is okay. They don't have many good flavors. Actually, the only Disco flavor I like is Bubblegum. It is vanilla ice cream with little chunks of bubblegum in it. After you eat the ice cream, you can blow bubbles with the gum. That's pretty fun.

Finally, there is Twinkle. Twinkle ice cream is mediocre. The only good thing about Twinkle is that it is relatively inexpensive. You can buy a whole carton of twinkle ice cream for $4.50. That's only two weeks' allowance for me.

Questions: Choose the correct option for each question.

1) Which of the following would be the best title for this passage?
A. Strawberry, Vanilla, Chocolate, and Bubblegum Too!
B. The Four Top Ice Cream Manufacturers
C. The Finest Ice Cream in the World
D. Picking the Best Ice Cream Manufacturer

2) If the author wanted to get a scoop of coffee ice cream, where would he or she probably go?

A. Randolph Farms
B. Goodies
C. Disco
D. Twinkle

3) In paragraph 1, the author uses a colon. A colon (:) looks like two dots, one on top of the other. Colons are used to separate different parts of a sentence. The part before the colon introduces an idea and can stand alone as a sentence. The part after the colon gives more detailed information about this idea, often as a list. If the colon could talk, it would say, "And here they are!"

Using this information, it can be understood that which of the following sentences contains the correct use of a colon?
A. My friends are: sweet, young, and generous.
B. I like: to talk on the phone at night.
C. I have three pets: Toto, Spot, and Rover.
D. I want a new bicycle: or new roller skates.

4) According to the passage, the author likes Randolph Farms ice cream because it

I. is all natural
II. is made in Bolivia
III. comes in many flavors
A. I only
B. I and II only
C. II and III only
D. I, II, and III

5) In paragraph 3 the author writes, "That's a long way to go to get cocoa, so it must be good." Using this information, we can understand that the author believes that

A. Goodies loses money on sales of chocolate ice cream
B. Bolivia makes the best cocoa in the world
C. things that are hard to get must be high quality
D. cocoa from the United States is not very good

6) According to the passage, the author likes Disco ice cream because it

A. is relatively inexpensive
B. has bubblegum in it
C. is made in Bolivia
D. is okay

7) According to the passage, how is Randolph Farms ice cream different than Goodies?

I. Randolph Farms has many different flavors and Goodies does not.
II. Randolph Farms uses all natural ingredients and Goodies does not.
III. Randolph Farms is very expensive and Goodies is not.

A. I only
B. I and II only
C. II and III only
D. I, II, and III

Q3. Write a memo to your employees to prepare their performance evaluation documents by a certain date.   (20)

Q4. Write an essay of about 300-350 words on any ONE of the given topics: (20)

a) Favorite historical personality

b) An incident that changed my life

c) Disasters of deforestation

Q5. Write a letter to a potential customer/client and persuade them to hire your company for an employee attendance application/software.   (20)

Q6. Discuss the importance of having good presentation skills and how visual presentation helps in delivering a speech. Give an example.   (20)

Q7. Write a letter to a client and refuse to refund the cost of the burnt machinery. (20)

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

NOTE: Attempt ALL questions.

1. Draw the DFA that can represent the following regular expression. Also mention the least number of states required to automate the given regular expression $(00)^*(11)^*$ **[8 marks]**

2. Draw DFA for the language that must contain 1000, where character set is $\{0,1\}$. Also write regular expression for this language.   **[6 marks]**

3. Convert following DFA to RE with each detailed step.   **[14 marks]**
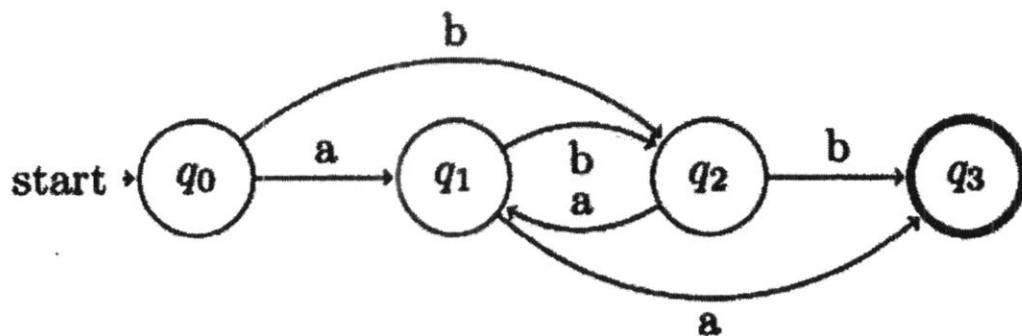
4. Convert following CFG to CNF   **[15 marks]**
   $S \rightarrow ASB$
   $A \rightarrow aAS|a|\varepsilon$
   $B \rightarrow SbS|A|bb$

5. Is the following grammar ambiguous, explain?   **[6 marks]**
   $S \rightarrow 0 \mid 1 \mid S+S \mid S \times S$

6. i) Construct a PDA for $L = \{0^n 1^m \mid m \geq, n \geq 0, m > n + 2\}$ **[10 + 8 = 16 marks]**
   ii) Write down the CFG for the PDA designed in Question 6-part i.

7. Construct a TM machine for checking the palindrome of the string of odd length over the character set $\{1,0\}$.   **[15 marks]**

Q.1. Encircle the right answer cutting and overwriting is not allowed.   **(10x2=20)**

1. Turing-recognizable and context-sensitive languages are classified as Type ___ and ___?
    a) 1,2   b) 0,1   c) 1,3   d) 0,2

2. Which of the following is true?
    a) $(01)^*0 = 0(100)^*$
    b) $(0+1)^*0(0+1)^*1(0+1) = (0+1)^*01(0+1)^*$
    c) $(0+1)^*010(0+1)+1^*0^* = (0+1)^*$
    d) None of the mentioned

3. Let the class of language accepted by 2-tape PDA machine be L1 and the class of languages represented by 1-tape PDA be L2 then
    a) L1<L2   b) L1>L2   c) L1 U L2 = .*   d) L1=L2

4. Suppose a language L1 has 2 states and L2 has 4 states. After using the cross product construction method, we have a machine M that accepts L1 ∩ L2. The total number of states in M:
    a) 6   b) 4   c) 2   d) 8

5. In PDA the input string is accepted when ....
    a) One of the Final States occur
    b) The stack becomes empty
    c) The stack becomes full
    d) both (a) and (b)

6. The operation in which two strings are written side by side to form a new longer string is called _____.
    a) Extension   b) Enhancement   c) Concatenation   d) None of the mentioned

7. Given Grammar: S→A, A→aA, A→e|b, B→Ab|b
    Which among the following productions are Useless productions?
    a) S→A   b) A→aA   c) A→e|b   d) B→bA|b

8. A turing machine operates over:
    a) finite memory tape
    b) infinite memory tape
    c) depends on the algorithm
    d) none of the mentioned

9. Simplify the given grammar:
    A→ aa| aaA| abBc, B→ abba| b
    a) A→ aa| aaA| ababbAc| abbc
    b) A→ aa| aaA| ababbAc| abbc, B→ abba|b
    c) A→ aa| aaA| abbc, B→abba
    d) None of the mentioned

10. In order to simplify a context free grammar, we can skip the following operation:
    a) Removal of null production
    b) Removal of useless symbols
    c) Removal of unit productions
    d) None of the mentioned

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

NOTE: *Attempt any FOUR questions. All questions carry equal marks.*

Q.2. A. Write an assembly program that inputs two strings, concatenate both strings and display on the Screen. **(10+5)**

    B. Describe the function LAHF instruction.

Q.3. A. Write an assembly program that inputs two strings and checks them whether they are same Or not **(10+5)**

    B. What is parity and zero flag?

Q.4. A. Write a program in assembly language that inputs 10 digits, stores them into an array and finds the Minimum digit input validation. You should input only digits and make sure that no other character Can be input. **(10+5)**

    B. What is the purpose of LEA instructions in assembly language?

Q.5. A. Write an assembly program that calculates the factorial on an integer number. **(10+5)**

    B. What are the three basic steps in instruction execution cycle?

Q.6. A. Write an assembly program that reads a character from keyboard and determines whether character is A vowel or consonant. **(10+5)**

    B. Write instructions that contain a loop to display 1 to 5 integers.

Q.7. A. Write an assembly language program that alphabetically sorts an array of ten characters. **(10+5)**

    B. How does CALL instruction works?

UNIVERSITY OF THE PUNJAB

B.S. Computer Science 2nd Year : Annual – 2021

Subject: Computer Org. and Assembly Language
Paper: 10

Time: 30 Min. Marks: 15

Roll No. in Fig. ....

Roll No. in Words. ....

....

Signature of Supdt.:

Q.1. Encircle the right answer cutting and overwriting is not allowed. (10x1.5=15)

1. Uses operator is used to push data in to stack.
   a. True   b. False
2. CS register cannot be used as destination operand in MOV instruction
   a. True   b. False
3. PUSH instruction cannot be used in 8086 CPU mode.
   a. True   b. False
4. Program counter register always contain address of next instruction.
   a. True   b. False
5. It is not necessary that program written in 8086 runs on 80386.
   a. True   b. False
6. The instruction SHL EBX, 4 will divide EBX by 16
   a. True   b. False
7. Using MOV instruction only 8-16, or 32 bit value can be moved in instruction pointer IP
   a. True   b. False
8. Computer organization consists of only CPU and memory and the interaction between them...
   a. True   b. False
9. A bus connects the CPU components which is the collection of parallel wires to transfer data form memory and I/O devices to CPU.
   a. True   b. False
10. Interrupts gates are the pointers to point to interrupt handlers in protected mode.
    a. True   b. False

UNIVERSITY OF THE PUNJAB

B.S. Computer Science 2nd Year : Annual – 2021

Subject: Linear Algebra & Probability and Statistics
Paper: 11

Time: 30 Min. Marks: 20

Roll No. in Fig. ....

Roll No. in Words. ....

....

....
Signature of Supdt.:

Attempt this Paper on this Question Sheet only.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Fill in the blanks with True / False   **(10x1=10)**

1. Multiplication of two matrices is called a scalar multiplication.------------

2. Determinant of a matrix = product of its Eigen values.--------------------

3. The rank and nullity of a system is always equal.--------------------

4. 0 is the Eigen value of A if and only if A is singular.-------------

5. Inverse of $A = \begin{bmatrix} 2 & 1 \\ -1 & 0 \end{bmatrix}$ exists.-----------------------------

6. Every subset of a vector space defines a subspace.----------------

7. Inner product defined on a vector space is commutative.------------------

8. A is invertible if and only if A is non-singular.------------------

9. The linear system $Ax = b$ is always consistent.----------------

10. Set of any two vectors of R^2 always defines its basis.---------------------

Q.2. Fill in the blanks with True / False   **(10x1=10)**

1. In a poker hand consisting of 5 cards, the probability of holding 2 aces and 3 jacks is ----
   --------.

2. Mode of the data 13, 18, 13, 14, 13, 16, 14, 21, 13 is --------------------------

3. Mean of the data 6, 8, 9, 3, 4, 6, 7, 6, 3 is------------------

4. If a 22-member club needs to elect a chair and a treasurer, how many different ways can these two to be elected?..........................

5. In how many ways can 7 graduate students be assigned to 1 triple and 2 double hotel rooms during a conference?---

6. Total area under the curve is----------------------------.

7. The cumulative probability density function is $F(x) = \begin{cases} 0, & x < -1, \\ \dfrac{x^3+1}{9}, & -1 \le x < 2, \\ 1, & x \ge 2. \end{cases}$ then find

   $p(0 < x \le 1) = $ _____.

8. If a random variable X denotes the number of heads when three distinct coins are tossed, then numerical description of the random variable X is----------------------------

9. Find the variance of the following scores on an exam: 92, 95, 85, 80, 75, 50?--------------
   ------

10. A ball is drawn at random from a box containing 6 red balls, 4 white balls and 5 blue balls. The probability that it is red is------------------

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

NOTE: *Attempt any TWO questions from each Section.*

SECTION – I   (LINEAR ALGEBRA)

Question 3

a) Determine whether the vectors $v_1 = (1, 2, 2, -1)$, $v_2 = (4, 9, 9, -4)$, and $v_3 = (5, 8, 9, -5)$ in R^4 are linearly dependent or linearly independent? (10mraks)

b) Determine whether all vectors of the form (a, 1, 1) define a subspace of R^3 or not?
(10mraks)

Question 4

Find the rank and nullity of the matrix A by reducing it to row echelon form. (20mraks)

$$A = \begin{bmatrix} 1 & 2 & -1 & 1 \\ 2 & 4 & -2 & 2 \\ 3 & 6 & -3 & 3 \\ 4 & 8 & -4 & 4 \end{bmatrix}$$

Question 5

Suppose that $x_1 = 3$, $x_2 = 0$, $x_3 = -1$, $x_4 = 5$ is a solution of a nonhomogeneous linear system $Ax = b$ and that the solution set of the homogeneous system $Ax = 0$ is given by the formulas

$x_1 = 5r - 2s, x_2 = s, x_3 = s + t, x_4 = t.$

a) Find a vector form of the general solution of $x = 0$.   (10mraks)

b) Find a vector form of the general solution of $Ax = b$.   (10mraks)

SECTION – II   (PROBABILITY AND STATISTICS)

Question 6

a) In a game, a player tosses 3 fair coins. He wins Rs.10 if 3 heads occur, Rs.5 if 2 heads occur, Rs.2 if only 1 head occurs and losses Rs.15 if no heads occur. Find his expected gain?   (10mraks)

b) What is the probability of getting a total of 7 or 11 when a pair of fair dice is tossed? (10mraks)

Question 7

The probability that an American industry will locate in Lahore, Pakistan, is 0.7, the probability that it will locate in Karachi, Pakistan, is 0.4, and the probability that it will locate in either Lahore or Karachi or both is 0.8. What is the probability that the industry will locate

a) In both cities?   (10mraks)

b) In neither city?   (10mraks)

Question 8

Four married couples have bought 8 seats in the same row for a concert. In how many different ways can they be seated?

a) With no restrictions?   (10mraks)

b) If each couple is to sit together?   (10mraks)