Institute of Information Technology (IIT)
Jahangirnagar University
1st Year 2nd Semester Examination 2016

Course name: Data Structures **Course code: IT-1201**

Answer any FIVE from the following questions.

1. a) What are the various types of data structures widely used? List the name of operations that can be performed on a particular data structure? 4
   b) Give a generic formula for finding the memory location of an array element, given the base address and array element size. 2
   c) What do you mean by the 'complexity of an algorithm'? Write some prominent features an algorithm should have. 3
   d) Evaluate the following: 3
      (i) [-8.5]
      (ii) (ii) [-8.5]
      (iii) (iii) -25(mod 7)

2. a) What is the basic difference between linear and binary search of an array? 2
   b) Let LA is linear array with N elements and K is a positive integer such that K<=N. Write an algorithm which inserts an element ITEM into the Kth position in LA. 3
   c) Consider the following list of numbers stored in array MARKS: 4

      MARKS:

56	23	45	77	19

      Sort the array in ascending order by simulating the Bubble Sort algorithm.
   d) Consider the linear array INFO(-6:8). Find the number of elements in the array. If Base(INFO)= 200 and w= 5 words per memory cell for the array, then find the address of INFO(7). 3

3. a) Consider the following two lists of test scores in algebra and geometry: 3

      ALGEBRA : 84, 35, 67, 45, 44
      GEOMETRY : 77, 56, 23, 39

      Represent the two lists in the same linear arrays TEST and LINK by showing the list of available spaces. Show the changes in the linked list if test score 56 from geometry is deleted and then 99 is added to the algebra.
   b) What are the two kinds of widely used header linked lists? What do you mean by 'free pool'? 3
   c) Differentiate between binary tree and binary search tree. Suppose the following eight numbers are inserted in order into an empty binary search tree: 50, 33, 44, 22, 77, 35, 60, 40. Build a binary search tree by showing each stage of the drawing. 4
   d) Consider the algebraic expression $E=(2x+y)(5a-b)^3$. Represent E by means of a binary tree T. 2

4. a) Suppose Q is an arithmetic expression written in infix notation. Write an algorithm which finds the equivalent postfix expression P. 4
   b) "Given a node, it is easy to visit its predecessor. Convenient to traverse lists backwards". Explain these statements. 2

c) Quicksort is a divide-and-conquer method for sorting". Explain the statement. 3

d) Explain double-ended queue and Priority Queue 3

5. a) Differentiate between binary tree and binary search tree. 2

b) Suppose the following eight numbers are inserted in order into an empty binary search tree: 50, 33, 44, 22, 77, 35, 60, 40. Build a binary search tree by showing each stage of the drawing. 3

c) What is a heap? Build a heap H from the following list of numbers: 3

18, 25, 50, 37, 80, 55,44, 66

d) Suppose the frequency of occurrence of some characters for an English text is shown in the table below. Construct a Huffman Coding tree. And then determine Huffman code for each of the character. 4

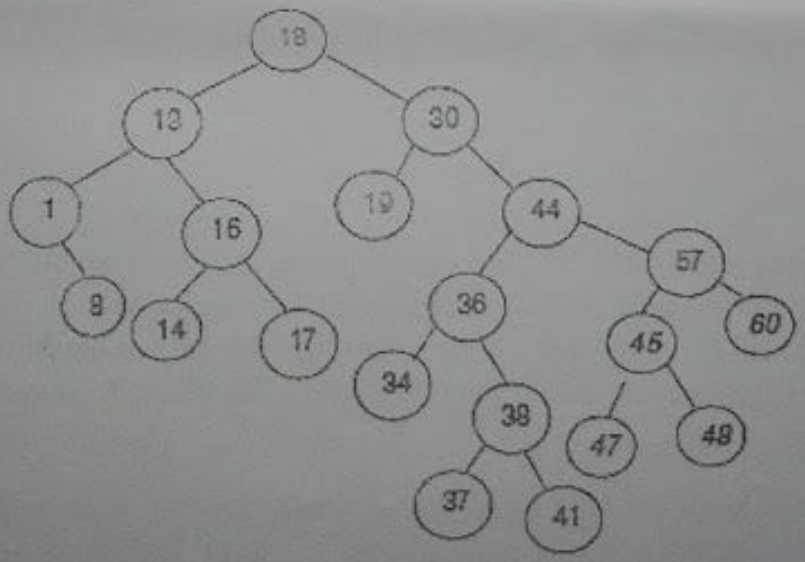
Letter	Frequency
A	100
C	50
E	120
M	60
U	70
Z	150

6. a) Inorder traversal and preorder traversal of a binary search tree produce two list 10 12 16 18 19 20 21 23 35 44 52 and 23 18 12 10 16 20 19 21 44 35 52 respectively. Now draw the binary search tree with these sequenced lists. 3

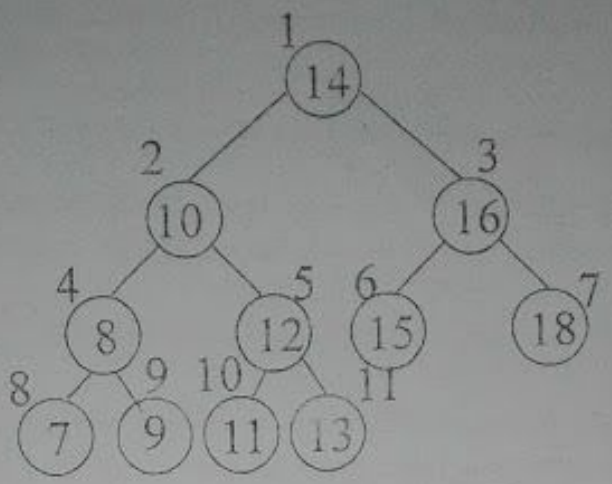
b) Insert 33 to the binary search tree that is obtained from the above question (b) and describe the changes after the insertion operation. 2

c) Which traversal of a binary search tree produces a descending sequence? 2

d) Delete 38 from the following Binary Search Tree 3



e) Show the array representation of the following binary tree.



7. a) Differentiate between the following types of graphs:

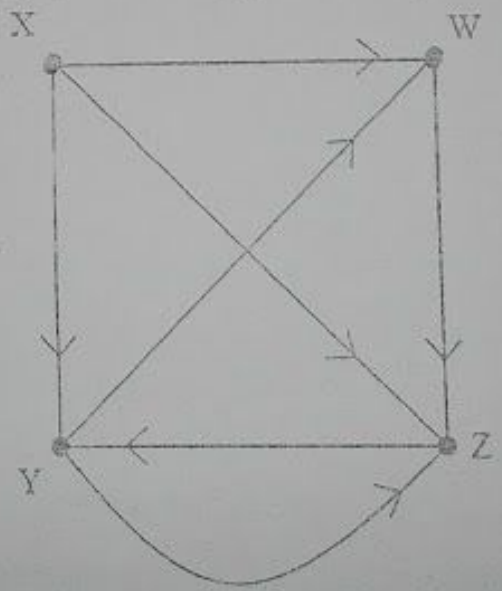
(i) Simple graph Vs. Multigraph.

(ii) (ii) Directed Vs. Undirected

b) Consider the directed graph shown here.

(i) Find the number of parallel edges the graph has.

(ii) Determine whether the graph is strongly or weakly connected?



c) Find the adjacency matrix A and path matrix P for the graph shown above.

Institute of Information Technology
Jahangirnagar University
1st Year 2nd Semester B.Sc. (Hons.) Final Examination 2016
Course Title: Object Oriented Programming Course Code: IT-1203
Total Marks: 60 Time: 3 hours

Answer any five Questions
(Sequence must be maintained in answering each of the questions)

1. a) Write the differences between the object oriented and procedural programming languages 3
   b) Is it make any difference if we don't write the line "using namespace std" in our code? 3
   Explain your opinion.
   c) What is run-time error? Give examples of two different types of run-time errors. 6

2. a) How and why is the scope resolution operator :: used in class definitions? 2
   b) Write a C++ program to create student class, read and print N student's name, roll_no, total_marks and percentage. Create void getDetails(void) member function to get student's details and void putDetails(void) member function to print student's details. 3
   c) Write a C++ program for unary minus (-) operator overloading. 2
   d) What will be the output of the following program? 2

```
#include<iostream.h>
Using namespace std;
class Ict
{
    public:
    Ict()
    {
        cout<< "Black";
    }
    ~Ict()
    {
        cout<< "Box";
    }
};
int main()
{
    Ict obj;
    return 0;
}
```

   e) How can derived class override a base class function? 3

3. a) What is the difference between function "overriding" and "overloading". Explain clearly with simple code examples. 2
   b) Noman has written the code like below. But, it is showing compile time error. Can you identify what mistake he has done? 3

```
class X
{
    //Class X Members
}
 class Y
{
    //Class Y Members
}
 class Z extends X, Y
{
```

```
    //Class Z Members
}
```

c) What is inheritance and polymorphism in C++? Explain. 3

d) How does polymorphism promote extensibility? 2

e) Can a class extend itself in Java? Explain. 2

4. a) Can there be any abstract method without abstract class? Explain. 2

b) Can you use abstract and final both with a method? Explain. 2

c) Below code is showing compile time error. Can you suggest the corrections? 3

```
class X

{
    public X(int i)
    {
        System.out.println(1);
    }
}
class Y extends X
{
    public Y()
    {
        System.out.println(2);
    }
}
```

d) What is wrong with the below code? Why it is showing compile time error? 3

```
public class A
{
    public A()
    {
        System.out.println(1);

        super();

        System.out.println(2);
    }
}
```

e) Why Line 10 in the below code is showing compilation error? 2

```
class X
{
    private int m = 48;
}
class Y extends X
{
    void methodOfY()
    {
        System.out.println(m); // Line 10
    }
}
```

5. a) Does field 'i' of Class A be inherited to Class B in the below code? 3

```
class A
{
    protected int i;
}
 class B extends A
```

```
}
```

b) If a class is located in a package, what do you need to change in the OS environment to be able to use it? 2

c) Is the below code written correctly? 2

```
class A
{
    private class B
    {
        //inner class
    }
}

public class MainClass extends A
{
    public static void main(String[] args)
    {
        B b = new B();
    }
}
```

d) Does Java support operator overloading? Explain. 2

e) What will be the output of the following program? 3

```
package pkg;
  class output {
      public static void main(String args[])
      {
          StringBuffer s1 = new StringBuffer("Hello");
          s1.setCharAt(1, x);
          System.out.println(s1);
      }
}
```

6. a) What is the difference between error and exception in java? 2

b) There are three statements in a try block – statement1, statement2 and statement3. After that there is a catch block to catch the exceptions occurred in the try block. Assume that exception has occurred in statement2. Does statement3 get executed or not? 3

c) What is wrong with following code? 3

```
public static void start() throws IOException, RuntimeException{
    throw new RuntimeException("Not able to Start");
}

public static void main(String args[]) {
    try {
         start();
    } catch (Exception ex) {
          ex.printStackTrace();
    } catch (RuntimeException re) {
          re.printStackTrace();
    }
}
```

d) Can we write only try block without catch and finally blocks? 2

e) What is similarity between NullPointerException and ArrayIndexOutOfBoundException in Java? 2

7 a) How can a Java application access the current thread? 2

b) What is the difference between Thread and Process in Java? 2

c) What will be the output of the program? 3

```
class s1 implements Runnable
{
    int x = 0, y = 0;
    int addX() {x++; return x;}
    int addY() {y++; return y;}
    public void run() {
    for(int i = 0; i < 10; i++)
        System.out.println(addX() + " " + addY());
}
    public static void main(String args[])
    {
        s1 run1 = new s1();
        s1 run2 = new s1();
        Thread t1 = new Thread(run1);
        Thread t2 = new Thread(run2);
        t1.start();
        t2.start();
    }
}
```

d) What will be the output of the program? 3

```
class s1 extends Thread
{
    public void run()
    {
        for(int i = 0; i < 3; i++)
        {
            System.out.println("A");
            System.out.println("B");
        }
    }
}
class Test120 extends Thread
{
    public void run()
    {
        for(int i = 0; i < 3; i++)
        {
            System.out.println("C");
            System.out.println("D");
        }
    }
    public static void main(String args[])
        {
        s1 t1 = new s1();
        Test120 t2 = new Test120();
        t1.start();
        t2.start();
    }
}
```

e) Can we call run() method of a Thread class instead of start() method? 2

1st Year 2nd Semester B.Sc.(Hons.) Final Examination-1016
Institute of Information Technology
Jahangirnagar University, Savar, Dhaka

Course Code: IT 1205 Course Title: Discrete Mathematics

Time: 3 Hours Answer any FIVE questions Full Mark: 60

1(a) Suppose a conditional statement **"If we are on vacation we go fishing."** Is given in English. 4
translate the sentence into a logical expression
I. Write the negation of the logical expression and translate the negation into English
II. Write the converse of the logical expression and translate the converse into English
III. Write the inverse of the logical expression and translate the inverse into English

(b) If P and Q are two sets such that P has 40 elements, PUQ has 60 elements and P∩Q has 10 elements, how many elements does Q have? 3

(c) Prove that i. $A \cup A = A$ ii. $A \cap A = A$ 2

(d) Define finite, infinite and proper sets, and prove that if A, B, C are finite sets, then 3
$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$$

2(a) Let R be the relation represented by the matrix 4
$$M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$
Find the matrices that represent R^3

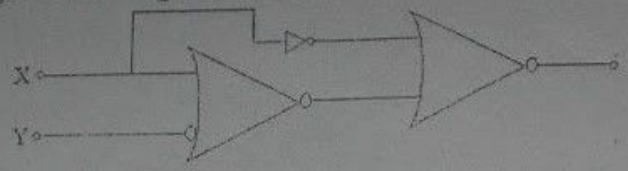
(b) Given that A = {2, 4, 5, 6, 7}, B = {2, 3}. R is a relation from A to B defined by $R = \{(a, b) : a \in A, b \in B \text{ and } a \text{ is divisible by } b\}$ find 3
I. R in the roster form
II. Domain of R
III. Range of R
IV. Represent R diagramatically.

(c) Functions f and g are defined by $f(x) = x^2 - 2x + 1$ and $g(x) = (x - 1)(x + 3)$, find $(f / g)(x)$ and its domain. 2.5

(d) Let A be all multiples of 4 and B be all multiples of 2. Is A a subset of B? And is B a subset of A? 2.5

3(a) Which one below shows the equivalence of DeMorgan's first theorem? Draw its logic gate. 3
I. OR gate and Exclusive OR gate.
II. NOR gate and Bubbled AND gate.
III. NOR gate and NAND gate.
IV. NAND gate and NOT gate

(b) Minimize the logic circuit shown in the given figure, and justify your answer by using Boolean Algebra/DeMorgan's theorem. 3



(b) Simplify the Boolean expression i. $F = C(B + C)(A + B + C)$. 2
ii. $F = (x + y)(x + z)$

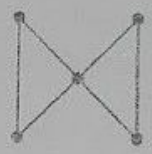
(c) I. Show that the propositions $\neg(p \wedge q)$ and $(\neg p \vee \neg q)$ are logically equivalent. 4
II. Verify that : $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology

4(a) Draw a picture of each of the following graphs, and state whether or not it is simple. 4
I. G1 = (V1,E1), where V1 = {a,b,c,d,e} and E1 = {ab, bc, ac, ad, de}.
II. G2 = (V2,E2), where V2 = {P,Q,R,S,T} and E2 = {PQ, PR, PS, PT, TR, PR}.
III. G3 = (V3,E3), where V3 = {v1,v2,v3,v4,v5} and E3 = {v1v1, v1v2, v2v3, v3v4, v5v4, v4v5}.

(b) Let T be a tree with p vertices of degree 1 and q other vertices. Show that the sum of the degrees of the vertices of degree greater than 1 is $p + 2(q - 1)$. 3

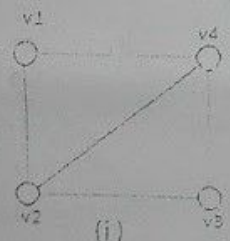
(c) Show that if a tree has two vertices of degree 3, then it must have at least 4 vertices of degree 1. 3

(d) Draw all the spanning trees of this graph: 2

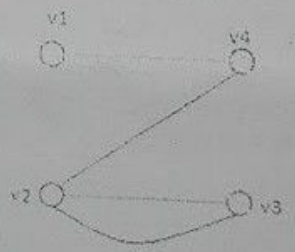


5(a) Define Dense and Sparse graphs with example. How many ways are to represent Graphs in Computer Memory? Cite an example of a graph with block diagram to represent into memory. 4

(b) Find the adjacency matrix $A = [a_{ij}]$ of each of the following graph G. 3



(i)



(ii)

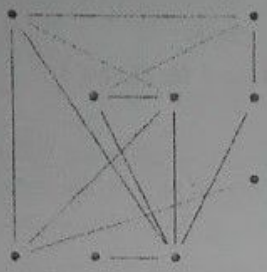
(c) Draw the graphs corresponding to each adjacency matrix. 3

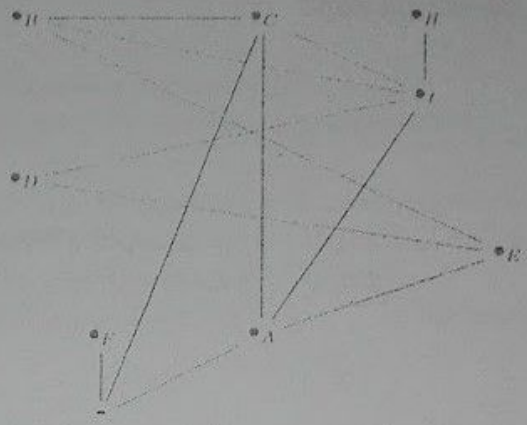
$$G1 = \begin{vmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{vmatrix}$$
(i)

$$G2 = \begin{vmatrix} 1 & 3 & 0 & 0 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 0 \end{vmatrix}$$
(ii)

(d) Assume a graph with five vertices, then how many edges contain in the graph and what is the name of that graph and how is it denoted? 2

6(a) With what conditions two graphs are said tobe isomorphic? Show that the following two graphs are isomorphic. 4



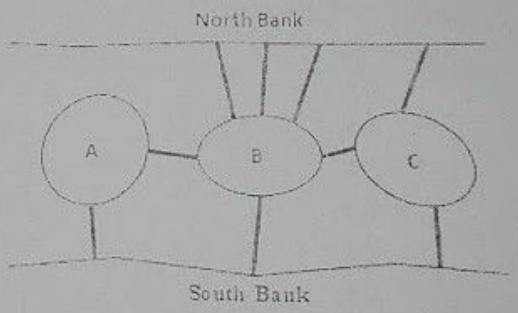


(b) For any graph $G = (V_G, E_G)$, show that $2|E_G| = \sum_{v \in V(G)} deg(v)$. 2

(c) In a certain town there is a river running through the middle of the city. There are three islands and nine bridges as shown in the figure below: 6

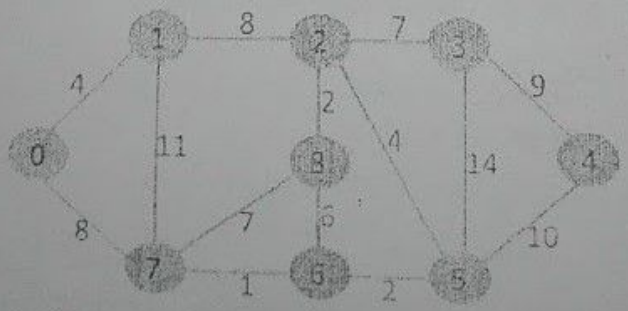
I. Draw a graph that models this situation

II. Is it possible to take a walk in this town, starting on the South Bank, crossing each bridge exactly once (and only once) and ending on island C? If so, how? If not, explain why not?



7(a) What are the different rules of Prim's and Kruskal's Algorithms. 2

(b) Compute the minimum spanning tree (MST) of the following graph by applying Prim's or Kruskal's algorithm., and write the all procedures step by step. 5



(c) Write the C implementation of Prim's or Kruskal's Algorithm. 5

Jahangirnagar University
Institute of Information technology
1st year 2nd semester B.Sc. (Honours) Examination 2016
Course no. IT 1207 Course Title- Economics

Time-3 hours **Total marks-60**

Answer any Five of the following questions.
All parts of a particular question must be answered consecutively

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1(a). Define economics. Distinguish between microeconomics and macroeconomics. 4
(b). Define production possibility frontier (PPF). Explain opportunity cost, efficiency, inefficiency with the help of a PPF. Why and how does PPF rotate? 5
(c). What are the fundamental economic problems of society? How does the market economy solve these problems? 3

2(a). What is demand? Define the law of demand. 4
(b). What are the determinants of demand and supply? 4
(c). Draw the demand and supply curves from the following schedules for candy. Indicate equilibrium price and quantity. 4

Price (taka per pack)	Quantity demanded(millions of pack per week)	Quantity supplied(millions of pack per week)
10	90	30
15	80	40
20	70	50
25	60	60
30	50	70
35	40	80
40	30	90

3(a). Distinguish between change in quantity demanded and change in demand. (use graphs). 5
(b). Define price elasticity of demand. How can it be measured? The following table gives the demand schedule for pulses. Determine elasticity of demand and comment on the nature of the commodity. 7

Price (taka per kg)	Quantity demanded (millions of kg per year)
5	25
10	20

4(a). What are the properties of Indifference curves? 3
(b). Why does Indifference curve convex to the origin? 2
(c). Briefly explain the budget line. When does budget line rotate and shift? (use graphs) 3
(d). Explain an individual's utility maximization choice with the help of diagram and mention the consumers' equilibrium condition. 4

5(a). Define cost of production. Find MC, AC, AVC and AFC from the hypothetical data of a firm below. 7

Quantity(Q)	Total Cost(TC)	Fixed Cost (FC)
1	100	50
2	140	50
3	157	50
4	160	50
5	220	50

(b). Draw the MC and AC curves in the same diagram and examine their relationship. 5

6(a). Why does the supply curve upward sloping? If (i) technological innovation occurs and (ii) raw materials prices increase in the economy, what will happen in the supply curve? Explain with relevant figures. 6

(b). Given a demand equation is $Q_d = 40 - 4P$; where Q_d is the quantity demand and P is the price and a supply equation $Qs = 20 + 2P$; where Qs is the quantity supplied and P is the price. Draw the demand and supply curve correctly and show the market equilibrium point and calculate the equilibrium price and quantity. 6

7(a). What are the goals of macro economics and what are the available instruments to achieve those goals? Explain with a table. 3

(b). Explain the circular flow of GDP. 4

(c). Below are some data on two goods produced in the economy. 5

Year	Price of rice(/kg) in Tk.	Quantity of rice (kg)	Price of cloth (/yard) in Tk.	Quantity of cloth (/yard)
2010	15	200	20	250
2011	25	250	35	400
2012	30	300	40	550

Compute nominal GDP, real GDP, and the GDP deflator and economic growth rate for each year, using 2010 as the base year.

Jahangirnagar University
Institute of Information Technology
1st Year 2nd Semester Final Examination
Course Title: Accounting (IT 1209)

Time: 3 Hours **Marks: 60**

- **Answer any five of the following questions.**
- **All parts of each question must be answered sequentially.**

Question 1: [3+9=12]

a) State the accounting equation and define each component with examples.

b) Salma Hyak opened aadvertising firm, on September 1, 2015. On September 31, the balance sheet showed: **Cash** Tk. 15,000, **Accounts Receivable** Tk. 4,500, **Supplies** Tk. 2,500, **Office Equipment** Tk. 15,000, **Accounts Payable** Tk. 7,600, and **Salma's Capital** Tk. 19,200. During October the following transactions occurred.

1. Invested Tk. 2,800 cash on business and a truck costing Tk. 8,000.
2. Collected Tk. 3,100 of accounts receivable.
3. Paid Tk. 6,200 cash on accounts payable.
4. Earned revenue of Tk. 13,000 of which Tk. 5,000 is collected in cash and billed the customer for the rest.
5. Paid salaries Tk. 4,000, rent Tk. 2,200, and insurance expenses Tk. 900for April.
6. Received Tk. 7,000 from AgraniBank––money borrowed on a note payable.
7. Withdrew Tk. 6,700 in cash for personal use.
8. Incurred utility expenses for month on account Tk. 580.

Required:

i. Prepare a tabular analysis of the Octobertransactions beginning with September 31 balances.

ii. Prepare an income statement for October, an owner's equity statement for October, and a balance sheet at October 31, 2015.

Question 2: [3+2+2=12]

a) Mr. Yasir started his own CPA firm, YasirConsulting, on February, 2015. The following transactions occurred during the month of February:

February 1 Yasirinvested Tk. 120,000 cash in the business.

5 Purchased furniture costing Tk. 90,000. 60% of the bill is paid borrowing money from the bank on notes payable and the rest is paid on cash.

7 Incurred advertising expense of Tk. 5,400 on account.

9 Paid Tk. 2,800 for a one-year insurance policy on the furniture.

15 Purchased supplies for cash Tk. 4,000.

23 Withdrew Tk. 5,000 furniture for personal use.

27 Received Tk. 15,200 in cash advance for consulting service that are expected to be completed by April.

30 Paid Tk. 4,000 on balance owed for advertising expense incurred on February 7.

Requirements:

i. Journalize the transactions.

ii. Post to the ledger accounts: Cash.

iii. Prepare a trial balance on July 31, 2014.

Question 3: **[4+2+6=12]**

a) Explain various types of adjusting entries with examples.

b) Identify the major limitations a trial balance suffers from.

c) The trial balances before and after adjustment for **Costain Company**at the end of its fiscal year are presented below.

Costain Company
Trial Balance
August 31, 2016

Particulars	Trial Balance		Adjusted Trial Balance	
	Dr	Cr	Dr	Cr
Cash	10,400		10,400	
Accounts Receivable	8,800		11,400	
Supplies	2,300		900	
Prepaid Insurance	4,000		2,500	
Equipment	14,000		14,000	
Accumulated Depreciation-Equipment		3,600		4,500
Accounts Payable		5,800		5,800
Salaries and Wages Payable		0		1,100
Unearned Rent Revenue		1,500		400
Owner's Capital		15,600		15,600
Service Revenue		34,000		36,600
Rent Revenue		11,000		12,100
Salaries and Wages Expense	17,000		18,100	
Supplies Expense	-0-		1,400	
Rent Expense	15,000		15,000	
Insurance Expense	0		1,500	
Depreciation Expense	0		900	
Total	71,500	71,500	76,100	76,100

Required:

Prepare the adjusting entries that were made.

Question 4: **[8+2+2=12]**

ZED plc manufactures one standard product, which sells atTk 12.

You are required to:

(a) Prepare from the data given below, a break-even and profit–volume graph showing the results for the six months ending 30 April and to determine:

(i) The fixed costs;

(ii) The variable cost per unit;

(iii) The profit–volume ratio;

(iv) The break-even point;

(v) The margin of safety;

Month	Sales (units)	Profit/(loss) (amount)
November	30 000	40 000
December	35 000	60 000
January	15 000	(20 000)
February	24 000	16 000
March	26 000	24 000
April	18 000	(8 000)

(b) Discuss the limitations of such a graph;
(c) Explain the use of the relevant range in sucha graph.

Question 5: [3+9=12]

a) Discuss from which aspects managerial accounting differs from financial accounting

b) Explain the following terms with examples:
   i) Manufacturing costs
   ii) Opportunity cost
   iii) Relevant range
   iv) Period cost
   v) Sunk cost

Question 6: [3+6+3=12]

a) Mr. Nahin started his Event Management Firm, Nahin's Creation, on January 1, 2015. The trial balance at March 31, 2015 is as follows:

Nahin's Creation
Trial Balance
March 31, 2015

Account Titles	Debit (Tk)	Credit (Tk)
Cash	22,800	
Accounts Receivable	11,240	
Supplies	2,100	
Prepaid Insurance	4,800	
Office Equipment	60,000	
Notes Payable		20,000
Accounts Payable		24,700
Nahin's Capital		40,000
Nahin's Drawings	1,200	
Service Revenue		27,240
Salaries Expense	4,400	
Travel Expense	2,600	
Rent Expense	2,400	
Miscellaneous Expense	400	
Total	**1,11940**	**1,11940**

Other Data

a. Supplies on hand total Tk. 960.
b. Depreciation is Tk. 2,000 per quarter.
c. Interest accrued on 6-month note payable, issued January 1, Tk. 600.
d. Insurance expires at the rate of Tk. 400 per month.
e. Services provided but unbilled at March 31 total Tk. 2060.

Requirements:

i) Prepare adjusting entries.

ii) Prepare a Worksheet on March 31, 2015.

iii) Prepare closing entries.

Question 7: [4+4+4=12]

a) Identify the steps in accounting cycle and indicate which steps are optional to follow.

b) Interserve Corp. has appointed an inexperienced accountant. During the first month of his job, the accountant made the following errors in journalizing transactions. All entrieswere posted as made.

i) A payment on account of $850 to a creditor was debited to Accounts Payable $580 and credited to Cash $580.

ii) The purchase of supplies on account for $950 was debited to Equipment $95 and credited to Accounts Payable $95.

iii) A $1,500 withdrawal of cash for N. Patel's personal use was debited to Salaries and WagesExpense $1,500 and credited to Cash $1,500.

iv) A collection of $1,000 from a client on account was debited to Cash $100 and credited to Service Revenue $100.

Required:

You are required to prepare the correcting entries.

c) What is a 'Classified Balance Sheet'? Illustrate a sample classified balance sheet.