Jahangirnagar University

1st Year 2nd Semester B.Sc. (Hons) Final Examination, 2014

Subject: Information Technology

Course Code: IT 1201 Course Title: Data Structures

Time: 3 Hours Full Marks: 60

Answer any **Five (05)** of the following questions: (Numerals at the right indicates the marks)

1. a) What are the merits and demerits of using binary search over linear search? Let DATA be an array of the following 13 sorted elements: 4

DATA

11	22	30	33	40	44	55	60	66	77	80	88	99

Suppose ITEM=40 is given. Simulate the binary search algorithm to find ITEM in the array.

b) Describe three parameters that are associated with an array. What do you mean by unit-based and zero-based indexing? 3

c) Consider the linear array TEMPERATURE(-15:32). Find the number of elements in this array. 1

d) Let MARKS be the array of following 8 unsorted elements: 4

MARKS

55	77	30	99	40	44	11	60

Sort the array by simulating Bubble sort algorithm.

2. a) Why is data structure needed? 3

b) What are Linear and Non linear data structures? Give two examples of each. 4

c) Define in brief an array. What are the types of array operations? 5

3. a) Differentiate between general tree and binary tree. Convert the general tree shown in figure-1 into its equivalent binary tree. 4

Figure-1

b) Consider the binary tree shown in figure-2 below. 4

(i) How many levels the tree has?

(ii) What is the height of node C?

(iii) Which nodes are the ancestors of node A?

(iv) How many successors a terminal node may have?

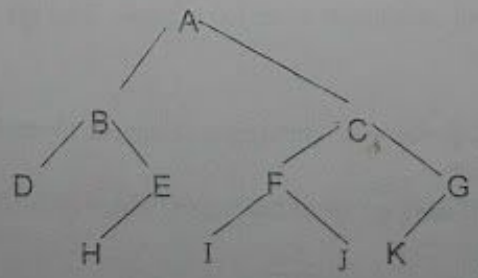


Figure-2

c) When is a binary tree said to be complete? Is the binary tree shown in figure-3 complete? Why or why not? 2

Figure-3

d) When is a binary tree said to be an extended binary tree? An extended binary tree has 9 internal nodes. How many external nodes it can have? 2

4. a) What are the different ways of representing a binary tree in the memory of a computer? Illustrate any one of them. 3

b) What is a threaded tree? Convert the binary tree shown in figure-2 into a two-way in-order threaded tree. 3

c) What are the criteria for building a heap? Build a heap H from the following list of numbers: 18, 25, 50, 37, 80, 55,44, 66. 3

d) What is Huffman coding? 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 characters. 3

Letter	Frequency
D	100
H	53
K	133
P	60
T	44
I	8

5. a) Differentiate between following types of graphs: 2

(i) Simple graph Vs. Multigraph, (ii) Directed Vs. Undirected graph

b) When is a graph said to be (i) bipartite (ii) regular? 2

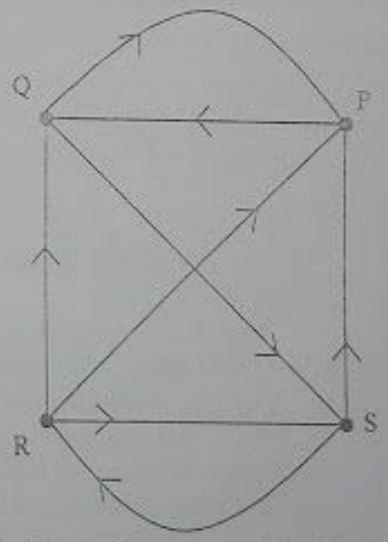
c) Consider the directed graph shown below. 4

(i) Find all the simple paths from Q to S.

(ii) Find the indeg(S) and outdeg(P).

(iii)Determine a cycle in the graph.

(iv) Which nodes are adjacent to node P?



d) List two traversal techniques used for a graph. Find the adjacency matrix A for the graph shown above. 4

6. a) Define stack and queue with appropriate examples. From where in a queue and an item is inserted or deleted? 3

b) Consider the following queue of characters, where QUEUE is a circular array which is allocated six memory cells: 4

FRONT=2, REAR=4 QUEUE: _, A, C, D, _, _. (_ denotes an empty memory cell). Describe the queue as the following operations take place:

(i) F is added to the list
(ii) Two letters are deleted
(iii) K, L and M are added to the queue
(iv) Two letters are deleted

c) Before deleting an item from a stack, what you must have to test first? Transform the following infix arithmetic expression into its equivalent reverse Polish notation by direct observation method. $(A + B \uparrow D) / (E - F) + G$ 3

d) What type of algorithm Quick Sort is? Through which data structure, Quick sort is accomplished? 2

7. a) What are the benefits of linked list over an array? 2

b) What is overflow and underflow? When do they occur in a linked list? 3

c) Define a two-way list with a schematic diagram. Why an ordinary linked list is called a one-way list? 3

d) Consider two lists of IIT students studying in 2nd and 4th semesters: 4

Students of 2nd Semester: Afsana, Ratul, Sadia, Tuli, Pathan

Students of 4th Semester: Heera, Tutul, Kobita, Razzak, Ferdousy, Zakir

Represent the two lists in a same linked list so that each list is maintained in the ascending order.

Jahangirnagar University

1st Year 2nd Semester B.Sc. (Hons) Final Examination, 2014

Subject: Information Technology

Course Code: IT 1203 Course Title: Object oriented Programming

Time: 3 Hours Full Marks: 60

Answer any **Five (05)** of the following questions: (Numerals at the right indicates the marks)

1. a) What is object-oriented programming? How is it different from the procedure-oriented programming? 4

   b) Distinguish between the following terms: 8

   (i) Objects and classes
   (ii) Data abstraction and data encapsulation
   (iii) Inheritance and polymorphism
   (iv) Dynamic binding and message passing

2. a) Find errors, if any, in the following C++ statements. 6

   (i) cout«"x=" x;
   (ii) m = 5; //n= 10; //s=m + n;
   (iii) cin »x; »y;
   (iv) cout«\n "Name:" « name;
   (v) cout «"Enter value:"; cin»x;
   (vi) /*Addition*/ z = x + y;

   b) What will happen when you run the following program? Explain your 3

```
#include <iostream.h>
void main()
{
        int i=10 , j=5;
        int modResult=0;
        int divResult=0;
        modResult = i%j;
        cout « mod Result « " " ;
        divResult =i/modResult;
        cout « divResult;
}
```

   c) What do you think is the main advantage of the comment // in C++ as compared to the old C type comment? 3

3. Can we assign a void pointer to an int type pointer? If not, why? How can we achieve this? 4

   The size of a char array that is declared to store a string should be one larger than the number of characters in the string. Why? Explain with example. 4

   What do you mean by dynamic initialization of a variable? Give an example. 4

4. a) What are the advantages of function prototype? Describe the different styles of writing prototypes. 4

   b) What do you meant by overloading of a function? When do we use this concept? 4

   c) When will you make a function inline? Why? How does an inline function differ from a preprocessor macro? 4

5. a) Answer the following questions after going through the following class: 8

```
class Seminar
{
        int Time;
public:
        Seminar();                                  //Function 1
        void Lecture()                              //Function 2
        {cout<<"Lectures in the seminar on"<<end1;}
```

```
        Seminar(int);                          //Function 3
        Seminar(Seminar &abc);                 //Function 4
        ~Seminar()                             //Function 5
        { cout<<"Vote of thanks"<<endl;}
};
```

i) In Object Oriented Programming, what is Function 5 referred as and when does it get invoked/called?

ii) In Object Oriented Programming, which concept is illustrated by Function 1, Function 3 and Function 4 all together?

iii) Which category of constructor-Function 1 belongs to? Write an example illustrating the calls for Function 1.

iv) Which category of constructor - Function 3 belongs to? Write an example illustrating the calls for Function 3

b) Write the reasons behind the introduction of inheritance in OOP. 4

6. a) What is meant by automatic conversion? Explain with figure the "Water-fall" model of type correction. 6

b) Rewrite the following program underlining the syntactical errors (if any) and its explanations. 6

```
#include<iostream.h>
void main()
{       int n = 44;
        int *ptr = &n;
        ++(*ptr);
        int  *const cptr = &n;
        ++(*cptr);
        ++cptr;
        const int kn=88;
        const int *ptrc = &kn;
        ++(*ptrc);
        ++ptrc;
        const int *const cptrc =&kn;
        ++(*cptrc);
        ++cptrc;
}
```

7. a) Find errors, if any, in the following function prototypes, also explain each in short, 6

(i) *float average(x, y);*
(ii) *int mul(int a,b);*
(iii) *int display(....);*
(iv) *void print(float data [], size = 20);*

b) Describe the mechanism of accessing data members and member functions in the following cases: 6

(i) Inside the **main** program,
(ii) Inside a member function of the same class,
(iii) Inside a member function of another class.

1st Year 2nd Semester B.Sc. (Hons) Final Examination, 2014

Subject: Information Technology

Course Code: IT 1205 Course Title: Discrete Mathematics

Time: 3 Hours Full Marks: 60

Answer any **five (05)** of the following questions: (Numerals at the right indicates the marks)

1. a. Translate each of the following sentences into propositional expression: 6
   i) "Neither the fox nor the lynx can catch the hare if the hare is alert and quick."
   ii) "You can either (stay at the hotel and watch TV) or (you can go to the museum and spend some time there)".
   b. Suppose a conditional statement **"If we are on vacation we go fishing."** is given in English. 4
   i) translate the sentence into a logical expression
   ii) write the negation of the logical expression and translate the negation into English
   iii) write the converse of the logical expression and translate the converse into English
   iv) write the inverse of the logical expression and translate the inverse into English
   c. Construct a truth table for the following compound proposition 2
   $(p \rightarrow q) \rightarrow (q \rightarrow p)$

2. a. Use the rule of inference to show that the hypotheses "Randy works hard","If Randy works hard, then he is a dull boy,""If Randy is a dull boy, then he will not get the job" imply the conclusion " Randy will not get the job". 6
   b. For the following premises, what relevant conclusion can be drawn. Explain your conclusion using rules of inference 6
   "If I eat spicy food , then I have strange dreams,""I have strange dreams if there is thunder while I sleep, I did not have strange dreams".

3. a. Use a direct proof to show that the product of two odd numbers is odd. 3
   b. In a room of 50 people all the people are wearing dresses of either red or white color, 30 are wearing red dress, 16 are wearing a combination of red and white. How many are wearing dresses that have only white color? 6
   c. How many one-to-one correspondence functions are there from a set with five elements to sets with the following number of elements? 3
   I. 4
   II. 5
   III. 6
   IV. 7

4. a. How many reflexive relations are there on a set of n elements? 4
   b. 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
   c. Can a simple graph exist with 15 vertices each of degree five? Explain your answer. 4

5. a. Define Generating Function. How many integers between 1 to 100 that are divisible by 3 but not by 7. 4
   b. There are 2500 students in a college, of these 1700 have taken a course in C, 1000 have taken a course Pascal and 550 have taken a course in networking. Further 750 have taken courses in both C and Pascal, 400 have taken courses in both C and networking, and 275 have taken courses in both Pascal and networking. If 200 of these students have taken courses in C, Pascal and Networking, 4+4
   i. How many of these 2500 students have taken a course in any of these courses C, pascal and Networking?
   ii. How many of these 2500 students have not taken a course in any of these courses C, pascal and Networking?

```
Seminar(int);                          //Function 3
Seminar(Seminar &abc);                 //Function 4
~Seminar()                             //Function 5
{ cout<<"Vote of thanks"<<endl;}
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i) In Object Oriented Programming, what is Function 5 referred as and when does it get invoked/called?

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Subject: Information Technology

Course Code: IT 1205 Course Title: Discrete Mathematics

Time: 3 Hours Full Marks: 60

Answer any **five (05)** of the following questions: (Numerals at the right indicates the marks)

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   c. How many one-to-one correspondence functions are there from a set with five elements to sets with the following number of elements? 3
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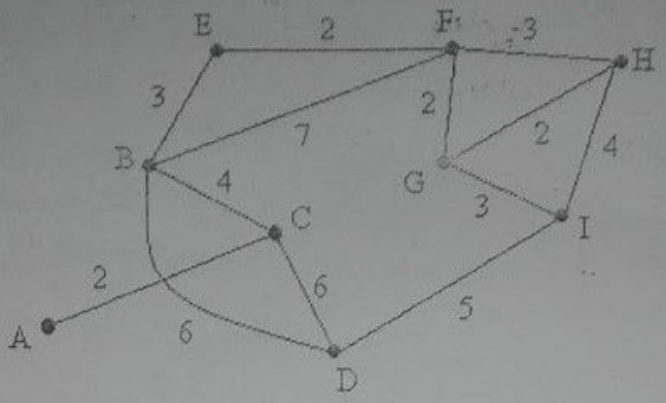
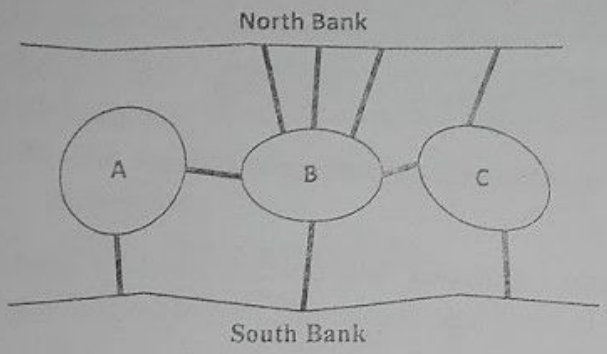
   i. How many of these 2500 students have taken a course in any of these courses C, pascal and Networking?
   ii. How many of these 2500 students have not taken a course in any of these courses C, pascal and Networking?

6. a. Find the shortest path from A to H of the following graph



b. 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



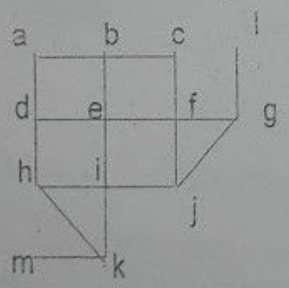
i. Draw a graph that models this situation

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. i. What is the ordered rooted tree that represents the expression $((x+y)\uparrow 2)+(x-4)/3)$? 4

ii. What is the prefix form?

b. Use a breath-first search to find a spanning tree for the graph shown in Fig 6



c. What is the difference between tree and graph? 2

Jahangirnagar University

1st Year 2nd Semester B.Sc. (Hons) Final Examination, 2014

Subject: Information Technology

Course Code: IT 1207 Course Title: Economics

Time: 3 Hours Full Marks: 60

Answer any **five (05)** of the following questions: (Numerals at the right indicates the marks)

1. a) A country produces two commodities. The following schedule indicates some points on the country's PPF: 8

	A	B	C	D	E	F	G
Butter	90	75	60	45	30	15	0
Gun	0	20	40	60	80	100	120

Graph the country's PPF and indicate efficient, inefficient and impossible points.

b) What will happen to the PPF if technological innovation takes place? Graph the new PPF. 4

2. a) What determines the quantity supplied for a commodity? Consider that only **Microsoft** and **IBM** operate in the computer software market, how do you get market supply curve? 8

b) Distinguish between the change in supply and the change in quantity supplied. 4

3. a) What is price elasticity of demand? What determines the price elasticity of demand for a commodity? 8

b) On Tuesday, price and quantity demanded are Tk. 7 and 120 units, respectively. Ten days later, price and quantity demanded are Tk. 5 and 150 units, respectively. Calculate the price elasticity of demand and interpret the result. 4

4. a) The cost structure of a pharmaceutical company presented in the following table. Fill the blanks in the following table- 6

Q	TFC	TVC	TC	AFC	AVC	ATC	MC
0	30	0					
1	30	20					
2	30	30					
3	30	45					
4	30	80					
5	30	145					

b) From the table draw the AFC curve. Why it is so shaped? What can you conclude about the shape of MC curve? 6

5. a) What is market? Explain the characteristics of perfectly competitive market. 8

b) What is monopoly? Examine the nature of the monopolistic competition. 4

6. a) Define GDP. Distinguish between nominal GDP and real GDP. 4

b) Calculate the nominal GDP, real GDP (Base year 2000), GDP Deflator and growth rate. 8

Year	Prices of rice	Quantity of rice	Prices of fish	Quantity of fish
2000	10	100	12	80
2001	12	150	15	120
2002	15	200	19	180
2003	20	250	21	230

7. a) Distinguish between Indifference Curve and Budget Line. 2

b) What happens to the budget line, when 2

i. All the prices double while the budget remains the same.

ii. One of the two prices rises while the other price & the budget remain same

c) What are the three big questions of macroeconomics? Explain. 4

d) Explain the circular flow of income of two sectors economy in a country. 4

Course Code: IT 1209 **Course Title:** Accounting

Time: 3 Hours **Full Marks:** 60

Answer any **five (05)** of the following questions: (Numerals at the right indicates the marks)

1. a) What uses of financial accounting information are made by (i) investors and (ii) creditors? 2

   b) John started a business his own delivery service, on June 1, 2010. The following transactions are occurred below: 10

   i. Invested 20,000 taka cash in the business.
   ii. Purchased a used van for delivery for 12,000 taka. John paid 3,000 cash and signed notes payable.
   iii. Paid taka 500 for office rent for the month.
   iv. Performed 3,000 service on account.
   v. Withdrew taka 200 cash for the personal use.
   vi. Purchased supplies for 140 taka on account.
   vii. Received a cash payment of taka 1,230 for service provided on transaction d.
   viii. Purchased gasoline for 100 on account.
   ix. Received a cash payment of tk.1,500 for service provided.
   x. Made a cash payment of taka 300 on the notes payable.
   xi. Paid utility bill of 3,000 taka.
   xii. Paid the gasoline bill.

   i. Show the effect of above transactions using the tabular format.
   ii. Prepare an Income Statement and Owner's Equity Statement and a Balance Sheet for the month of June, 2010.

2. a) State the accounting equation and define each component with examples. 3

   b) Nafiz Ul fahad opened a financial analysis office, on March 1, 2013. On March 31, the balance sheet showed: **Cash** Tk. 10,000, **Accounts Receivable** Tk. 3,000, **Supplies** Tk. 1,000, **Office Equipment** Tk. 12,000, **Accounts Payable** Tk. 8,400, and **Fahad, Capital** Tk. 17,600. During April the following transactions occurred. 9

   i. Collected Tk. 2,400 of accounts receivable.
   ii. Paid Tk. 5,600 cash on accounts payable.
   iii. Earned revenue of Tk. 16,000 of which Tk. 6,000 is collected in cash and the balance is due in May.
   iv. Purchased additional office equipment for Tk. 4,000, paying Tk. 800 in cash and the balance on account.
   v. Paid salaries Tk. 5,000, rent for April Tk. 1,800, and advertising expenses Tk. 800.
   vi. Withdrew Tk. 1,400 in cash for personal use.
   vii. Received Tk. 3,000 from Janata Bank—money borrowed on a note payable.
   viii. Incurred utility expenses for month on account Tk. 440.

   Required:

   i. Prepare a tabular analysis of the April transactions beginning with March 31 balances.
   ii. Prepare an income statement for April, an owner's equity statement for April, and a balance sheet at April 31.

3. Mr. Bashar Iqbal started his own consulting firm, Iqbal Consulting, on July, 2014. The following transactions occurred during the month of July: 12

July 1 Iqbal invested Tk. 80,000 cash in the business.
July 3 Purchased land costing Tk. 60,000 for cash.
July 7 Incurred advertising expense of Tk. 3,600 on account.
July 8 Paid salaries to employees $3,500.
July 12 Hired Chartered Accountants at a salary of $30,000 per month, effective August 1.
July 17 Paid Tk. 3,500 cash for a one-year insurance policy.
July 22 Withdrew Tk. 2,000 cash for personal use.
July 26 Received Tk. 11,400 in cash for consulting service.
July 29 Received Tk, 17,000 in cash in advance for consulting service.
July 30 Paid Tk. 1,800 on balance owed for advertising incurred on July 7.

Requirements:

i. Journalize the transactions.
ii. Post to the ledger accounts: Cash, consulting service revenue.
iii. Prepare a trial balance on July 31, 2014.

4. Soheli Advertising Agency was founded by Ms. Soheli Sorhad on January, 2013. Selected data from the December 31 are presented below: 12

Soheli Advertising Agency
Work Sheet
For the year ended December 31, 2013

Particulars	Trial Balance		Adjusted Trial Balance	
	Dr	Cr	Dr	Cr
Cash	22,000		24,000	
Accounts Receivable	40,000		45,000	
Art Supplies	17,200		14,000	
Prepaid Insurance	6,700		5,000	
Printing Equipment	1,20,000		1,20,000	
Accumulated Depreciation- Printing Equipment		56,000		66,000
Accounts Payable		10,000		14,000
Interest Payable		0		300
Notes Payable		10,000		10,000
Unearned Advertising fees		14,400		11,200
Salaries Payable		0		2,600
Soheli Sorhad, Capital		51,000		51,000
Soheli Sorhad, Drawings	24,000		24,000	
Advertising Revenue		1,17,200		1,27,400
Salaries Expense	20,000		22,600	
Insurance Expense			1,700	
Interest Expense	700		1,000	
Depreciation Expense			10,000	
Art Supplies Expense			7,200	
Rent Expense	8,000		8,000	
Total	**2,58,600**	**2,58,600**	**2,82,500**	**2,82,500**

Required:

i. Journalize the annual adjusting entries that were made.
ii. Journalize the closing entries.
iii. Prepare the Post-Closing Trial Balance.

5. The comparative statements of Dillon Company are presented below. 12

DILLON COMPANY
Income Statement
For Year Ended December 31

Particulars	2014	2013
Net sales (all on account)	9,00,000	7,80,000
Expenses		
Cost of goods sold	6,22,500	5,31,000
Selling and administrative	1,81,200	1,72,000
Interest expense	11,700	9,000
Income tax expense	27,000	21,000
Total expenses	8,42,400	7,32,000
Net income	57,600	46,800

DILLON COMPANY
Balance Sheets
December 31

Assets	2014	2013
Current assets:		
Cash	31,500	27,000
Short-term investments	27,000	22,500
Accounts receivable (net)	1,29,000	1,10,000
Inventory	1,35,000	1,05,000
Total current assets	3,22,500	2,65,500
Plant assets (net)	6,34,500	5,74,500
Total assets	9,57,000	8,40,000
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	183,000	1,65,000
Income taxes payable	34,500	30,000
Total current liabilities	2,17,500	1,95,000
Long-term liabilities:		
Bonds payable	1,80,000	1,20,000
Total liabilities	3,97,500	3,15,000
Stockholders' equity:		
Common stock ($5 par)	2,25,000	2,25,000
Retained earnings	3,34,500	3,00,000
Total stockholders' equity	5,59,500	5,25,000
Total liabilities and stockholders' equity	9,57,000	8,40,000

Additional data:
The common stock recently sold at Tk. 30 per share.

Required:
Compute the following ratios for 2014.

(a) Current. (b) Acid-test. (c) Receivables turnover.

(d) Inventory turnover. (e) Profit margin (f) Asset turnover.

(g) Return on assets. (h) Return on common stockholders' equity.

(i) Earnings per share (j) Price-earnings. (k) Payout.

(l) Debt to total assets.

6. a) What is meant by the term 'Break-even point'? What methods are used to compute break-even point? Illustrate with example. 5

b) K Company manufactures and sells a specialized cordless telephone for high electromagnetic radiation environments. The company's contribution format income statement for the most recent year is given below: 7

Particulars	Total	Per Unit
Sales (10,000 units)	6,00,000	60
Less: variable expenses	4,50,000	45
Contribution margin	1,50,000	15
Less: fixed expenses	1,20,000	
Net operating income	30,000	

Required:

i. Compute the company's Contribution Margin ratio.

ii. Compute the company's break-even point in both units and sales amount. Use the equation method.

iii. Assume that sales increase by Tk. 2,00,000 next year. If cost behaviour patterns remain unchanged, by how much will the company's net operating income increase? Use the CM ratio to determine your answer.

iv. Refer to the original data. Assume that next year management wants the company to earn a minimum profit of Tk. 45,000. How many units will have to be sold to meet this target profit?

7. a) Why do accrual basis financial statements provide more useful information than cash basis statements? 2

b) Mr. Sharif is the owner of Sharif Consultancy Firm started their operation on 1st June 2011. The following information is related with the operations of June, 2011: 10

June 1: Sharif invested Tk 1,50,000 cash, and Equipment of Tk 1,00,000 in the business.

June 3: Purchase Furniture of Tk 50,000 from Smile Company and 60% paid in cash.

June 12: Cash Tk 65,000 received in advance from Electra Ltd. for providing consultancy service.

June 15: Paid one year rental of Tk 20,000 in advance.

June 18: Provided consultancy services and billed Samsung company Tk. 40,000.

June 22: Received Utility bill Tk 1,000 to be paid next month.

June 25: Paid Tk. 14,000 to Smile Company for accounts payable due.

June 27: Performed services for cash Tk. 16,000.

June 28: Monthly salary accrued of Tk. 10,000.

June 30: Received tk. 30,000 from Samsung company.

Requirements:

a. Journalize the above transactions.

b. Prepare ledgers (i) Cash (ii) Accounts payable (iii) Accounts Receivable iv) Service Revenue.