Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
1st Year 1st Semester B.Sc. Engineering Examination-2015
Course No: CSE100   Course Title: Computer Fundamentals
Total marks: 70   Time: 3 hours.

N.B.
  i.   Answer **SIX** questions, taking any **THREE** from each section.
  ii. All questions are of equal values
  iii. Use separate answer script for each section

SECTION - A

1. a) Is there any limitation of a computer? Justify your answer. $1\frac{2}{3}$

    b) Describe the components of a computer system.   5

    c) Classify the computers based on capacity and define them briefly.   4

2. a) Perform the operation $(27.A3)_{16} + (17.25)_8 = (\ ? \ )_2$ 4

    b) Using 8-bits for representing numbers perform the operation 12 - 17, first by   4
        ordinary binary subtraction and then by 2's complement addition.

    c) Evaluate $1100011 \div 101$ $3\frac{2}{3}$

3. a) Write DeMorgan's theorem for three variables and prove it.   4

    b) What are universal gates? Prove that NOR is a universal gate.   4

    c) Give the main characteristics of different kinds of bus of a microcomputer. $3\frac{2}{3}$

4. a) Distinguish between programmed I/O and direct memory access. $3\frac{2}{3}$

    b) Mention different categories of scanners and briefly define them.   4

    c) Discuss different types of printers.   4

SECTION - B

5. a) Draw a diagram of computer system organization and explain its details. $3\frac{2}{3}$

    b) List and define control and status resisters.   3

    c) How does control unit communicate with ALU and primary memory? Explain with a 5
        block diagram.

6. a) What do you understand by serial access and random access of memory?

   b) Show the computer memory hierarchy by a diagram.

   c) Give the differences between static and dynamic RAMs.

   d) What is the role of cache memory in a computer system?

7. a) What is software? Mention different categories of software. $3\frac{2}{3}$

   b) Define operating system. Discuss the main task of an operating system.   5

   c) What do you understand by DBMS? What are the basic activities of a DBMS?   3

8. a) Define computer network. Name different types of computer networks and briefly   4
explain their characteristics.

   b) Show different kinds of LAN topology with appropriate figure.   3

   c) Distinguish between internet and intranet. Mention some applications of internet in $2\frac{2}{3}$
modern world.   +2

er **SIX** questions, taking any **THREE** from each section.
questions are of equal values
Use **separate answer script** for each section.

Section A

1. a) What is power? Prove that, p=vi, where the symbols have their usual meaning.   3

   b) Calculate the power supplied or absorbed by each element from the following circuit.   4.67
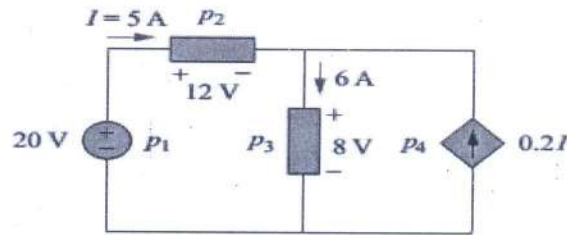
   c) Write short notes on active and passive element with example. Discuss about passive sign convention of power.   4

2. a) Write down short notes on dependent and independent sources with examples. Classify dependent sources with their symbols.   4

   b) Explain Kirchhoff's voltage and current law.   3.67
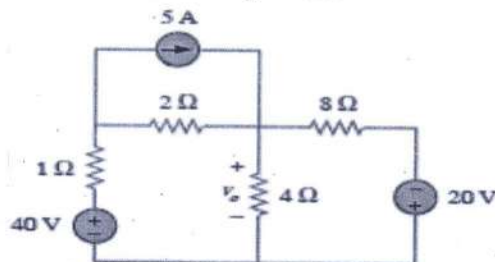
   c) Find the currents and voltages in the circuit   4
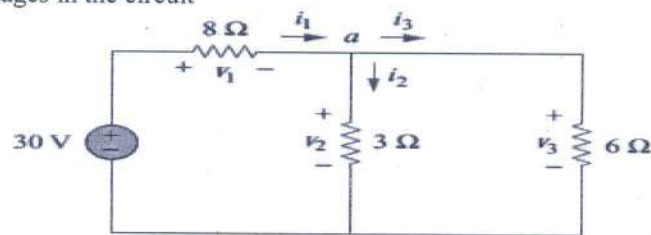
3. a) Calculate the equivalent resistance R_{ab} 6
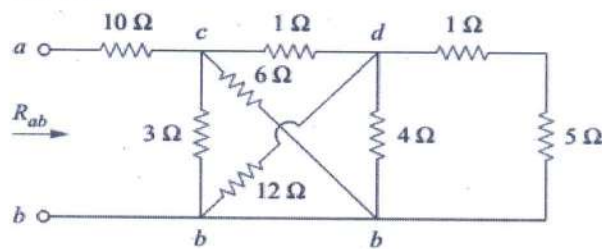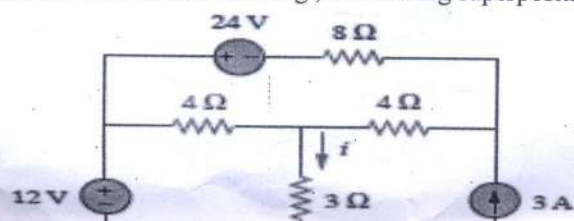

   b) Obtain the equivalent resistance R_{ab} for the circuit using Y-Δ conversion   5.67
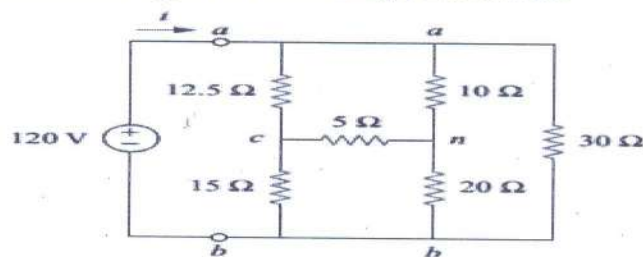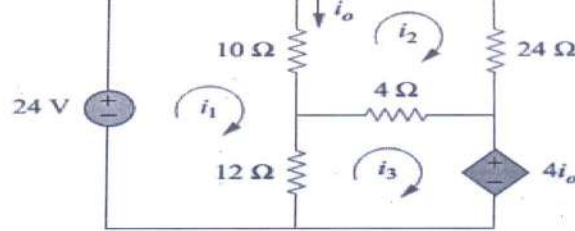

4. a) Apply mesh analysis to find v_0 in the following circuit: 5.67
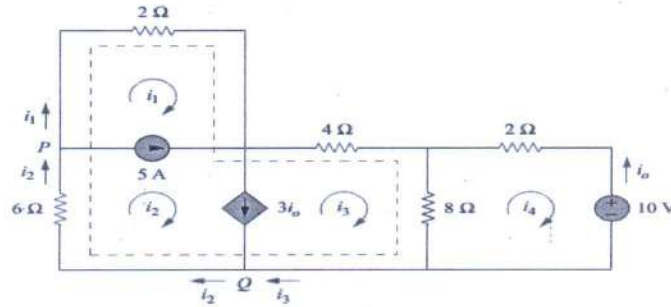

   b) What is linearity? For the circuit in the following , find i using superposition theorem.   6
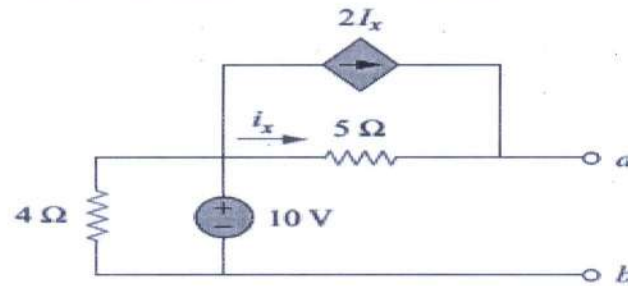

b) For the circuit in figure find i_1 to i_4 using mesh analysis — 6

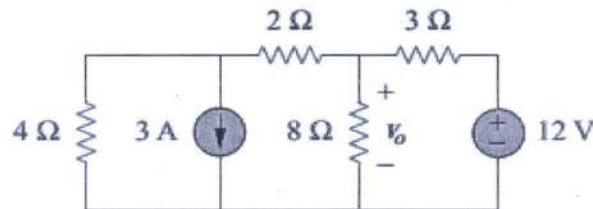6. a) Calculate Thevenin and Norton equivalent circuit from the following figure — 4

b) State maximum power transfer theorem. Prove that $p_{max} = \dfrac{v_{Th}^2}{4R_{Th}}$, where the symbols have their usual meanings. — 3.67

c) Use source transformation to find v_o in the circuit — 4

7. a) What is transfer function? Find the transfer function for the ckt in the following. Obtain its zeros and poles also. — 4
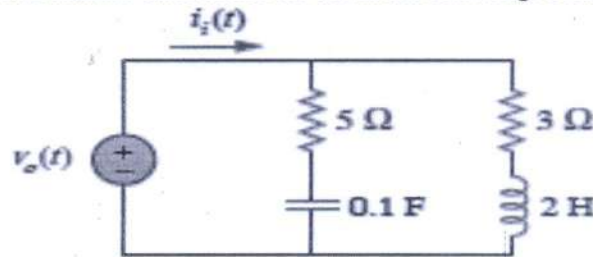
b) In the following, R=2Ω, L=1mH and c=0.4μF. Find i) resonant frequency ii) quality factor & iii) Band width. — 4
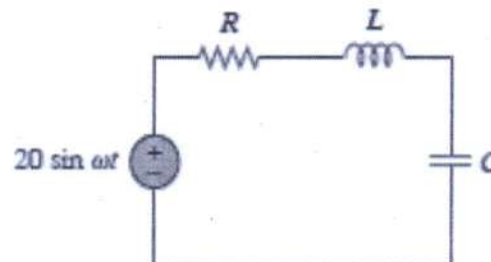
c) What is passive filter? Draw ideal frequency response of four types of passive filters. — 3.67

8. a) Describe about photospetrometer. For a cathode ray tube oscilloscope, prove that $D = \dfrac{L l_d E_d}{2 d E_a}$, where the symbols have their usual meaning. — 4.67 +4

usual meaning.

b) What are the main parts of a CRT oscilloscope? Also draw the internal structure of it

c) What will be the output of the following program:

```
int x=3;
switch(x)
{
    case 1:
        printf("Computer ");
    case 2:
        printf("Science ");
    case 3:
        printf("Engineering ");
    default:
        printf("Department ");
}
```

d) Write a program to read three integer values from the keyboard and displays the output stating if they are the sides of right-angled triangle.   3

3   a) Draw the control flow diagram of while loop. How does while loop differ from do-while loop?   2 + 2

b) Write a program that accepts an integer number and check whether it is prime or not prime.   3

c) What will be the output of the following program: 3

```
int main( )
{
    int i,j;
    for (i=1;i<=5;i++)
    {
        for (j=1;j<=i;j++)
        {
            if(i==j)
                printf("1 ");
            else
                printf("0 ");
        }
        printf("\n");
    }
    return 0;
}
```

d) What do mean by the following statement? When do you use it? $1\frac{2}{3}$
   for(;;)

4.   a)   i.   What do you mean by *int arr[5]*?   5
       ii.   What are the first and last elements of it?
       iii.   What is the base address of an array?
       iv.   If you know the base address of an array how can you calculate the address of next element?
       v.   What will happen when you do: *int arr[5]={0};*

b) Write down the functions of *break* and *continue* statements. $2\frac{2}{3}$

ents' id taking Math, B is the set of students' id taking Science. Write a program
find the set C = A - B, i.e., students taking Math but not Science.
For example,
A={2,3,5,7} and B={3,4,5} then C = {2,7}

SECTION-B

5. a) Strings can be read using both *scanf* and *gets* function. Compare them critically and $2\frac{2}{3}$
        describe situations where one is superior to another.
    b) Write a program in C to convert a line of text to uppercase. 3
        Sample Input: Hi, I am fine.
        Sample Output: HI, I AM FINE.
    c) What is the output of the following statement? 2
             printf("%d", strcmp("push", "pull"));
    d) Write a user-defined function to implement the built-in function *strcat*. 4

6. a) What do you mean by call by value and call by reference of a function? Explain $3\frac{2}{3}$
        with an example.
    b) What is the output of the following code: 3
```
void test (int list[], int x)
{
    int i;
    for(i=0; i<x; i++)
    {
        list[i] = list[i] * 10;
    }
}
int main(){
    int i,x[]={1,2,3,4,5};
    test (x, 5);
    for(i=0; i<5; i++)
    {
        printf("%d \n",x[i]);
    }
    return 0;
}
```
    c) Distinguish the scope of global and local variables. 2

    d) Describe recursive function with example. 3

7. a) What is pointer? What are the reasons of using pointer? $2\frac{2}{3}$

    b) What will be the value of y for the following program: 2
```
int x=9,y;
int *ptr;
ptr=&x;
y=*ptr;
```

c) Define a structure type, *struct book* containing three members: book's title, author, and price. Using this structure write a program to read the information of the book from the keyboard and print the same on the screen. There is a list of max. 100 such books. User will also specify the number books as input.

d) How does a structure differ from an array? 2

e) Distinguish between logical AND operator and bitwise AND operator? $1\frac{2}{3}$

8. a) What do the following statements do? 2

```
while ( (c = fgetc(fp)) != EOF){
     fputc(c, stdout);
}
```

b) Write down the operation of following functions: 3
fopen(), fclose(), getc(), putc(), getw(), and putw()

c) Define the different mode of operation of a data file. $2\frac{2}{3}$

d) A file named data.txt contains a series of integer numbers. Write a program that will show how many times a given number appears in the files. The search value will be given from keyboard. 4

Full Marks: 70   Times: 3 Hours

SECTION-A

Read the passage carefully and answer the questions bellow:-

"We started out to get a computer in the hands of everyday people, and we succeeded beyond our wildest dreams."-Steve Jobs

Steve Jobs' vision of a "computer for the rest of us" sparked the PC revolution and made Apple an icon of American business. But somewhere along the way, Jobs' vision got clouded -- some say by his ego -- and he was ousted from the company he helped found. Few will disagree that Jobs did indeed impede Apple's growth, yet without him, the company lost its sense of direction and pioneering spirit. After nearly 10 years of plummeting sales, Apple turned to its visionary founder for help, and a little older, little wiser Jobs engineered one of the most amazing turnarounds of the 20th century.

The adopted son of a Mountain View, Calif., machinist, Steve Jobs showed an early interest in electronics and gadgetry. While in high school, he boldly called Hewlett-Packard co-founder and president William Hewlett to ask for parts for a school project. Impressed by Jobs, Hewlett not only gave him the parts, but also offered him a summer internship at Hewlett-Packard. It was there that Jobs met and befriended Steve Wozniak, a young engineer five years his senior with a penchant for tinkering.

After graduating from high school, Jobs enrolled in Reed College but dropped out after one semester. He had become fascinated by Eastern spiritualism, and he took a part-time job designing video games for Atari in order to finance a trip to India to study Eastern culture and religion.

When Jobs returned to the U.S., he renewed his friendship with Wozniak, who had been trying to build a small computer. To Wozniak, it was just a hobby, but the visionary Jobs grasped the marketing potential of such a device and convinced Wozniak to go into business with him. In 1975, the 20-year-old Jobs and Wozniak set up shop in Jobs' parents' garage, dubbed the venture Apple, and began working on the prototype of the Apple I. To generate the $1,350 in capital they used to start Apple, Steve Jobs sold his Volkswagen microbus, and Steve Wozniak sold his Hewlett-Packard calculator.

Although the Apple I sold mainly to hobbyists, it generated enough cash to enable Jobs and Wozniak to improve and refine their design. In 1977, they introduced the Apple II -- the first personal computer with color graphics and a keyboard. Designed for beginners the user-friendly Apple II was a tremendous success, ushering in the era of the personal computer. First-year sales topped $3 million. Two years later, sales ballooned to $200 million.

But by 1980, Apple's shine was starting to wear off. Increased competition combined with less than stellar sales of the Apple III and its follow-up, the LISA, caused the company to lose nearly half its market to IBM. Faced with declining sales, Jobs introduced the Apple Macintosh in 1984. The first personal computer to feature a graphical-user interface controlled by a mouse, the Macintosh was a true breakthrough in terms of ease-of-use. But the marketing behind it was flawed. Jobs had envisioned the Mac as a home computer, but at $2,495, it was too expensive for the consumer market. When consumer sales failed to reach projections, Jobs tried pitching the Mac as a business computer. But with little memory, no hard drive and no networking capabilities, the Mac had almost none of the features corporate America wanted.

For Jobs, this turn of events spelled serious trouble. He clashed with Apple's board of directors and, in 1983, was ousted from the board by CEO John Sculley, whom Jobs had handpicked to help him run Apple. Stripped of all power and control, Jobs eventually sold his shares of Apple stock and resigned in 1985.

Later that year, using a portion of the money from the stock sale, Jobs launched NeXT Computer Co., with the goal of building a breakthrough computer that would revolutionize research and higher education. Introduced in 1988, the NeXT computer boasted a host of innovations, including notably fast processing speeds, exceptional graphics and an optical disk drive. But priced at $9,950, the NeXT was too expensive to attract enough sales to keep the company afloat. Undeterred, Jobs switched the company's focus from hardware to software. He also began paying more attention to his other business, Pixar Animation Studios, which he had purchased from George Lucas in 1986.

After cutting a three-picture deal with Disney, Jobs set out to create the first ever computer-animated feature film. Four years in the making, "Toy Story" was a certified smash hit when it was released in November 1995. Fueled by this success, Jobs took Pixar public in 1996, and by the end of the first day of trading, his 80 percent share of the company

was worth $1 billion. After nearly 10 years of struggling, Jobs had finally hit it big. But the best was yet to con.

Within days of Pixar's arrival on the stock market, Apple bought NeXT for $400 million and re-appointeo Apple's board of directors as an advisor to Apple chairman and CEO Gilbert F. Amelio. It was an act of desperati. Apple's part. Because they had failed to develop a next-generation Macintosh operating system, the firm's share of \ PC market had dropped to just 5.3 percent, and they hoped that Jobs could help turn the company around.

At the end of March 1997, Apple announced a quarterly loss of $708 million. Three months later, Amelio resigned and Jobs took over as interim CEO. Once again in charge of Apple, Jobs struck a deal with Microsoft to help ensure Apple's survival. Under the arrangement, Microsoft invested $150 million for a nonvoting minority stake in Apple, and the companies agreed to "cooperate on several sales and technology fronts." Next, Jobs installed the G3 PowerPC microprocessor in all Apple computers, making them faster than competing Pentium PCs. He also spearheaded the development of the iMac, a new line of affordable home desktops, which debuted in August 1998 to rave reviews. Under Jobs' guidance, Apple quickly returned to profitability, and by the end of 1998, boasted sales of $5.9 billion.

Against all odds, Steve Jobs pulled the company he founded and loved back from the brink. Apple once again was healthy and churning out the kind of breakthrough products that made the Apple name synonymous with innovation. But Apple's innovations were just getting started. Over the next decade, the company rolled out a series of revolutionary products, including the iPod portable digital audio player in 2001, an online marketplace called the Apple iTunes Store in 2003, the iPhone handset in 2007 and the iPad tablet computer in 2010. The design and functionality of these devices resonated with users worldwide. Apple says it has sold more than 300 million iPods, over 100 million iPhones and more than 15 million iPad devices. The company has sold billions of songs from its iTunes Store.

Despite his professional successes, Jobs struggled with health issues. In mid-2004, he announced in an email to Apple employees that he had undergone an operation to remove a cancerous tumor from his pancreas. In January 2011, following a liver transplant, Jobs said he was taking a medical leave of absence from Apple but said he'd continue as CEO and "be involved in major strategic decisions for the company."

Eight months later, on August 24, Apple's board of directors announced that Jobs had resigned as CEO and that he would be replaced by COO Tim Cook. Jobs said he would remain with the company as chairman. "I have always said if there ever came a day when I could no longer meet my duties and expectations as Apple's CEO, I would be the first to let you know," Jobs said in a letter announcing his resignation. "Unfortunately, that day has come."

Jobs once described himself as a "hopeless romantic" who just wanted to make a difference. Quite appropriately like the archetypal romantic hero who reaches for greatness but fails, only to find wisdom and maturity in exile, an older, wiser Steve Jobs returned triumphant to save his kingdom.

1) i.Point out some disappointing factors on the way of Jobs's revolution in Apple. 1.5x4

ii. Why do you think Jobs labelled himself as a "hopeless romantic"?
iii. Why does Jobs fascinate you the most?
iv."Quite appropriately like the archetypal romantic hero who reaches for greatness but fails, only to find wisdom and maturity in exile, an older, wiser Steve Jobs returned triumphant to save his kingdom." Explain.

2) Write five key ideas from the passage that feature Steve Jobs as a revolutionary. 2

3) Write the closest meanings of the marked words as they are used the passage(any eight): 4

4) Adding affixes to the following stems,make new words and write sentences with them(any five): 5
new,woman,united,true,interpret,configure,world

5) Transcribe the following words(any five): toil,unique,sure,jot,youth,studious,remain,bold,avoid,usher,pinch, 5

measure,zero

6) Write the correct forms of verb(any eight): 4
i.I knew that she ... Madrid before, so I asked her to recommend a good hotel.
has visited/has been visiting/visited/had visited
ii. She promised to help me if I ... the answer myself.
haven't found/didn't find/won't find/wouldn't find
iii. He said that they ... each other for many years.
know/have known/knew/had known
iv. I saw that she ... to hold back her tears.

is trying/has been trying/was trying

He knew that she ... as her eyes were red.

is crying/has been crying/was crying/had been crying

vi. I asked her whether she ... there with me, but she said no.

goes/is going/will go/would go

vii. She said that the robber... her when she was opening the door to her apartment.

attacked/has attacked/was attacking/had attacked

viii. I wanted to see her but I didn't know if she ...in town.

is/was/were/had been

ix. He told me that he would visit them when... he from Spain.

has returned/returned/will return/would return

x. My younger daughter learned in class yesterday that the Earth ...around the Sun.

revolves/is revolving/revolved/was revolving

7)   Identify the subordinate clause types and give examples for each of the identified clause(any five):   5

i. Unless you apologize to me, I'll not spare you.

ii. Do or fail.

iii. This is the place where he was awaiting me.

iv. Look before you leap.

v. It was quite worrying that he was not reaching on time.

vi. Those were the days when there was a unique harmony among all people.

8)   Put the right modals (any eight):

i.You ...go there with me. I can handle it; it's not difficult.

may not

must not

don't have to

had better not

ii. ... bring me a glass of cold water?

Could you

Can't you

Would you mind

Why don't you

iii. I ....give you a lift to the station. My car broke down yesterday.

must not

should not

may not

can't

iv. I don't know what to do.You ...your father for advice.

are able to ask

could ask

must ask

have to ask

v. He didn't go to the park with us yesterday because he ...write a report.

should

must

had to

could

vi. I left my bag here just five minutes ago. You... it!   4

may have seen

must have seen

were able to see

could see

vii. You ...the bills two weeks ago.

had better pay

should pay

ought to pay

should have paid

viii. I don't know how to help you. Try asking Anton for help. He ...be able to find a solution.

must

has to

might

will

ix. I ...play tennis every day when I was younger.

had to

was able to

used to

could

x. You want to call them now? It's already after midnight! They... .

must sleep

should sleep

may sleep

must be sleeping

is trying/has been trying/was trying

He knew that she ... as her eyes were red.

is crying/has been crying/was crying/had been crying

vi. I asked her whether she ... there with me, but she said no.

goes/is going/will go/would go

vii. She said that the robber... her when she was opening the door to her apartment.

attacked/has attacked/was attacking/had attacked

viii. I wanted to see her but I didn't know if she ...in town.

is/was/were/had been

ix. He told me that he would visit them when... he from Spain.

has returned/returned/will return/would return

x. My younger daughter learned in class yesterday that the Earth ...around the Sun.

revolves/is revolving/revolved/was revolving

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ii. ... bring me a glass of cold water?

Could you

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iii. I ....give you a lift to the station. My car broke down yesterday.

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should not

may not

can't

iv. I don't know what to do.You ...your father for advice.

are able to ask

could ask

must ask

have to ask

v. He didn't go to the park with us yesterday because he ...write a report.

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viii. I don't know how to help you. Try asking Anton for help. He ...be able to find a solution.

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ix. I ...play tennis every day when I was younger.

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used to

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x. You want to call them now? It's already after midnight! They... .

must sleep

should sleep

may sleep

must be sleeping

SECTION-B

9) For the women in our country, security of justice is more important than the security of political rights. What do you think?   Or,   **15**

Some people believe that the best way of learning about life is by listening to the advice of family and friends. Other people believe that the best way of learning about life is through personal experience. Compare the advantages of these two different ways of learning about life. Which do you think is preferable? Use specific examples to support your preference.

10) Write a book/film review (any one)   **8**

   i. Hat Bariye Dao
   ii. Pipra Bidya

11) BRACNet Limited is looking for a junior executive engineer whose key responsibility will be to ...   **12**

maintain LAN, Hardware & Software System Services & Configurations for Office.
Company Information:

BRACNet Limited
Address : House # 26, Road # 28, Block-K, Banani, Dhaka- 1213.
Web : www.bracnet.net

Educational Requirements:
B.Sc in CSE
Experience Requirements:
1 to 2 year(s)
The applicants should have experience in the following business area(s):
ISP, IT Enabled Service
Additional Job Requirements
Only males are allowed to apply.
Hardworking, result driven, friendly attitude.
Strong sense of responsibility and ability to work under pressure.
Must be very good in written and oral communications.
Good hands-on skills in MS Word, MS Excel, and MS Power Point.
 Efficient and interested candidates are asked to send their cover letter along with a
CV on/before 26th May 2015 at bracnethr@gmail.com .

Or

Pixel Software Ltd. Is looking for some young and creative Assistant Programmers. Now write a cover latter for the post of assistant Programmer with reference to an advertisement dated on 15 may, 2015 in "The Daily Observer". Application should be sent to Managing Director of Pixels Software Ltd, 23/1, Dhanmondi, Dhaka on ar before 31 May, 2015.

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
1st Year 1st Semester B.Sc. Engineering Examination-2015

Course No: MAT104   Course Title: Algebra, Trigonometry and Vector
Marks: 70   Time: 4 hours

N.B.

i) Answer **SIX** questions, taking any **THREE** from each section.
ii) All questions are of equal values.
iii) Use separate answer script for each section.

Section-A

1. (a) State and prove De-Morgan's laws.   5
    (b) Let $f: A \to B$ and $g: B \to C$ have inverse functions $f^{-1}: B \to A$ and $g^{-1}: C \to B$. Then   6.67
         prove that the composite functions $gof: A \to C$ is an one–one and onto mapping.

2. (a) State and prove fundamental theorem of algebra.   4
    (b) If a, b, c are the roots of the equation $x^3 - px^2 + qx - r = 0$, find the value of   7.67
         (i) $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}$ (ii) $\frac{1}{b^2c^2} + \frac{1}{c^2a^2} + \frac{1}{a^2b^2}$

3. (a) Solve the equation $x^3 - 15x = 126$ by use Cardan's rules.   4
    (b) State and prove De-Moivre's theorem.   4
    (c) Find all the values of $(1 + i)^{1/9}$ 3.67

4. (a) Establish the Gregory series.   4
    (b) Show that $\frac{\pi}{8} = \frac{1}{1.3} + \frac{1}{5.7} + \frac{1}{9.11} + \dots \dots \dots \dots$ 3.67
    (c) If $\tan(x + iy) = u + iv$. Prove that $u^2 + v^2 + 2u \cot 2x = 1$ 4

Section-B

5. (a) Define vector, scalar and unit vector. Given   3.67
         $\vec{r_1} = 3i - 2j + k$, $\vec{r_2} = 2i - 4j - 3k$, $\vec{r_3} = -i + 2j + 2k$. Find the magnitudes of $2r_1 -$
         $3r_2 - 5r_3$.
    (b) Prove that $\vec{A} \times (\vec{B} \times \vec{C}) = (\vec{A}.\vec{C})\vec{B} - (\vec{A}.\vec{B})\vec{C}$ 4
    (c) Find the angle between $\vec{A} = 2i + 2j - k$ and $\vec{B} = 6i - 3j + 2k$.   4

6. (a) Determine the velocity and acceleration at any time when the particle moves along a curve   5
         whose parametric equations are $x = e^{-t}, y = 2\cos 3t$, $z = 2\sin 3t$, where t is the time.
    (b) Find the unit tangent vector to any point on the curve $x = t^2 + 1$, $y = 4t - 3$, $z = 2t^2 -$ 3.67
         $6t$. Also determine the unit tangent at the point where t = 2.
    (c) Define gradient, divergence and curl.   3

7. (a) If $\emptyset(x, y, z) = 3x^2y - y^3z^2$. Find $\nabla\emptyset$ at the point (1, -2, -1).   3.67
    (b) If $\vec{V} = \vec{\omega} \times \vec{r}$, prove that $\vec{\omega} = 1/2 \nabla \times \vec{V}$ 4
    (c) Prove that $\nabla \times (\nabla\emptyset) = 0$ 4

8. (a) State and prove Divergence theorem   6
    (b) Verify Green's theorem in the plane for $\oint_c (xy + y^2)dx + x^2 dy$ where C is the closed   5.67
         curve of the region bounded by $y = x$ and $y = x^2$.

Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj
Department of computer Science & Engineering
1st Year 1st Semester B.Sc. Engg. Examination-2015
Course No.: CSE110   Course Name: Discrete Mathematics

Full Marks: 70   Times: 4 Hours
N.B.:
i. Answer SIX questions, taking any THREE from each section.
ii. All questions are of equal values
iii. Use separate answer script for each section.

Section A

1. a) Define Power set. Determine the power set Power(A) of A={a, b, c, d}   3

    b) What is Venn diagram? Why will you use venn diagram?   2

    c) Prove (A∪B)\(A∩B)=(A\B) ∪(B\A)   3

    d) Among 50 students in a class, 26 got an A+ in the first examination and 21 got an A+ in the   3.67
        second examination. If 17 students did not get an A+ in either examination, how many
        students got A+ in both examinations? Draw the Venn diagram also.

2. a) Define composition of relations with an example.   1.67

    b) Consider the following relation R on the set A = {1, 2, 3}:   1+1
        R = {(1, 2), (2, 3), (3, 3)}   +2
        i.   Find reflexive(R)
        ii.   Find symmetric(R) and
        iii.   Find transitive(R)

    c) Given A={1, 2, 3, 4} and B={x, y, z}. Let R be the following relation from A to B: 3
            R={(1,y), (1,z), (3,y), (4,x), (4,z)}.
            (i)   Determine the matrix of the relation.
            (ii)   Find the inverse relation of R.
            (iii)   Determine the domain and range of R.

    d) Let A={1, 2, 3, 4}. Consider the following relation in A: R= {(1,1), (2,2), (2,3), (3,2), (4,2), (4,4)}   3
            (i)   Draw its directed graph.
            (ii)   Is R transitive relation?
            (iii)   Find R^2=RoR.

3. a) What is function?   1

    b) Define one-to-one, onto and correspondence with example.   4

    c) Find (i) ⌊7.5⌋ (ii) ⌊-7.5⌋ (iii) ⌊-18⌋ (iv) ⌈7.5⌉ (v) ⌈-7.5⌉ (vi) ⌈-18⌉   3.67

    d) Show that the proposition ¬(p ∧ q) and ¬p ∨¬ q are logically equivalent.   3

4. a) What is proposition?   1

    b) Give the definition of conjunction, disjunction and negation with truth table.   3.67

    c) Verify the proposition p ∨ ¬ (p ∧ q) is tautology.   3

    d) Let A={1, 2, 3, 4}. Determine the truth value of each of the following statements.   4
            (i)   (∃x ∈ A)(x+3=10)   (ii) (∀x ∈A)(x+3<10)
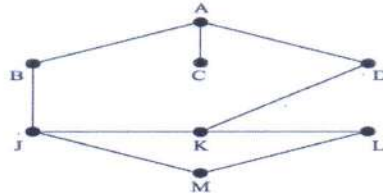   (ii)   (∃x ∈ A)(x+3<5)   (iv) (∀x ∈A)(x+3<7)

Section B

5. a) Consider the following multigraphs: 2+1+1
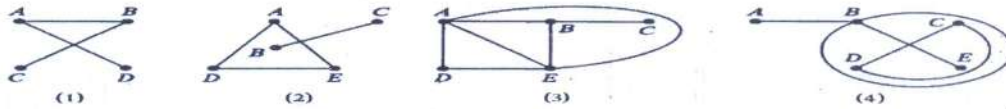
    i.   Which of them are connected? If a graph is not connected, find its connected components.
    ii.   Which are cycle-free?   iii. Which are loop-free?

b) Find the order of vertices of G in following figure are processed using DFS algorithm beginning at   3.67
vertex A.

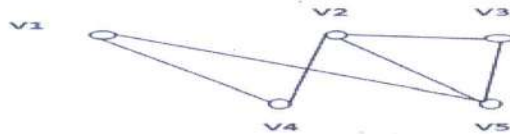c) Define Isomorphic graph, Complete graph and Bipartite graph with example.   3

d) Draw the graph $K_{3,4}$ 1

6. a) What is spanning tree? Consider the following figure and produce a minimum spanning tree using Kruskal's   4
algorithm.

b) Distinguish between cutpoints and bridges.   2

c) Consider the following addresses which are in random order: 3
    1, 2.2.1, 3.2, 2.2.1.1, 1.1.1, 0, 2.1, 3.2.1.1, 3, 3.1, 2.2, 2.1.1, 3.2.1, 1.1, 3.2.1.2, 2, 1.1.2
    (i)   Place the addresses in lexicographic order.
    (ii) Draw the corresponding ordered rooted tree.

d) Distinguish between complete and extended binary trees.   2.67

7. a) What is binary tree?   1

b) Let T be the binary tree stored in memory as in the following figure, where root = 14   2+2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
INFO	H	R		P	B		E		C	F	Q	S		A	K	L		D
LEFT	4	0		0	18		1		0	15	0	0		5	2	0		0
RIGHT	11	0		0	7		0		10	16	12	0		9	0	0		0

    i.   Draw the diagram of T.
    ii.   List the nodes of T in preorder, inorder and postorder.

c) Consider the algebraic expression $E=(2x+y)(5a-b)^3$ 3
    (i)   Draw the tree T which corresponds to the expression E.
    (ii)   Find the preorder, inorder and postorder of T.

d) Construct a tree by using Huffman algorithm for the following data items and weights: 3.67

Data Item	A	B	C	D	E	F	G	H
Weight	22	5	11	19	2	11	25	5

8. a) What is semigroups?   1

b) Briefly explain Groups with example.   2.67

c) Consider the language L={ab, c} over A={a, b, c}. Find   3
    (i) L^0 (ii) L^3 (iii) L^{-2}

d) What is grammar? Discuss different types of grammars.   5