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Bangabandhu Sheikh Mujibur Rahman Science and Technology University  
Department of Computer Science and Engineering  
1<sup>st</sup> Year 1st Semester B.Sc. Engineering Examination-2016

Course No: CSE 100

Full Marks: 60

Course Title: Computer Fundamentals  
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

- Q.1 (a) What is a Computer? What are the differences between system software and application software? 4
- (b) Describe the main components of a computer system. 4
- (c) List the various types of computers on the basis of size and capacity. 2
- Q.2 (a) Give the main characteristics of different kinds of bus of a microcomputer. 6
- (b) What is the information processing cycle? 4
- Q.3 (a) What is the Internet? Why do users access the Internet? 5
- (b) What are the differences between storage media and storage device? 3
- (c) What do you mean by volatile and non-volatile memory? Give example. 2
- Q.4 (a) What do you understand by BCD, ASCII and EBCDIC codes? 3.5
- (b) i. Convert  $36A32_{16}$  to its octal equivalent. 3.5
- ii. Convert  $1010110_2$  to its decimal equivalent.
- (c) Define the following terms: One's complement and Two's complement. Convert the following  $1101101$  to its equivalent two's complement. 3

SECTION B

- Q.5 (a) What is operating system? 2
- (b) Briefly explain the various function of an operating system. 4
- (c) What is network topology? Discuss different types of network topology. 4
- Q.6 (a) What are the difference between CD-R and CD-RW? 3
- (b) What are the characteristics of CRT and LCD? 4
- (c) Differentiate between a compiler, translator and interpreter. 3
- Q.7 (a) How an operating system manages the execution of more than one application program at the same time? Explain. 5
- (b) Describe the five-layer TCP/IP internet protocol hierarchy. 5
- Q.8 (a) Discuss the difference between memory and storage. Why is storage necessary? 4
- (b) What are RAM, ROM and why these are called so? 3
- (c) What is computer network? What are the differences between LAN and WAN? 3

Full Marks: 60

Times: 3 Hours

N.B.:

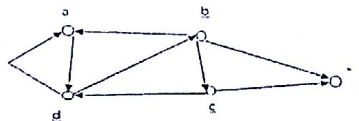
- i. Answer SIX questions, taking any THREE from each section.
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- iii. Use separate answer script for each section.

#### Section A

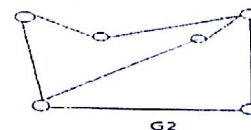
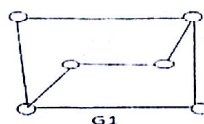
1. a) What is universal set? 1  
 b) What is Venn diagram? Why will you use venn diagram? 3  
 c) Show that we can have  $A \cap B = A \cap C$  without  $B = C$ . 2  
 d) What are the rules of inference for qualified statement? Show that the premises "A student in this class has not read the book" and "Everyone in this class passed the first exam." imply the conclusion "Someone who passed the first exam has not read the book". 4
  
2. a) Define relation with an example. 1  
 b) Consider the following relation R on the set  $A = \{1, 2, 3, 4\}$ : 5  
 $R_1 = \{(1, 1), (1, 2), (2, 3), (1, 3), (4, 4)\}$   
 $R_2 = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$   
 $R_3 = \{(1, 3), (2, 1)\}$   
 $R_4 = \{\}$   
 $R_5 = A \times A$   
 Determine which of the relation are transitive or not and why?  
 c) Suppose R and S are relations on a set A and R is antisymmetric. Prove that  $R \cap S$  is antisymmetric. 4
  
3. a) What is function? 1  
 b) Define ordered pairs, n-tuples and inverse function with example. 3  
 c) Define one-to-one, onto and correspondence with example. 3  
 d) Find (i)  $\lceil 13.2 \rceil$  (ii)  $\lfloor -0.17 \rfloor$  (iii)  $\lceil -34 \rceil$  (iv)  $\lfloor 13.2 \rfloor$  (v)  $\lceil -0.17 \rceil$  (vi)  $\lfloor 34 \rfloor$  3
  
4. a) Give the definition of conjunction and disjunction with truth table. 1  
 b) Differentiate between tautology and fallacy. 2  
 c) Using logical equivalence laws show that  $\neg(p \vee (\neg p \wedge q))$  and  $\neg p \wedge \neg q$  are logically equivalent. 3  
 d) Let  $A = \{1, 2, 3, 4\}$ . Determine the truth value of each of the following statements. 4  
 (i)  $(\exists x \in A)(x+3=10)$  (ii)  $(\forall x \in A)(x+3 < 10)$   
 (ii)  $(\exists x \in A)(x+3 < 5)$  (iv)  $(\forall x \in A)(x+3 < 7)$

#### Section B

5. a) What is graph? Consider the following graph and find in-degree and out-degree of each vertex. 1+2



- b) Prove the isomorphism of the following two graphs G1 and G2. 4



- c) Define Complete graph and Bipartite graph with example. 3

6. a) What is spanning trees?

1

b) Draw an undirected graph represented by the given adjacency matrix.

2

0	1	3	0	4
1	2	1	3	0
3	1	1	0	1
0	3	0	0	2
4	0	1	2	3

c) Find the number of connected graphs with four vertices. Draw them.

2

d) How will you represent graph in computer memory?

5

7. a) What is graph coloring?

1

b) Differentiate between rooted tree and ordered rooted tree.

2

c) Consider the following directed graph G:

4

$V(G) = \{a, b, c, d, e, f, g\}$

i. Identify any loops or parallel edges.

ii. Are there any sources in G?

iii. Are there any sinks in G?

iv. Find the subgraph H of G determined by the vertex set  $V' = \{a, b, c, d\}$

d) Write down the application of shortest-path algorithm.

3

8. a) What is complete binary tree? Give figure.

1

b) Define binary search tree? How will you insert a data item in binary search tree?

2

c) What is heap? Discuss different types of heap.

3

d) Suppose the preorder and inorder traversals of a binary tree T yield the following sequence of nodes:

4

Preorder: G, B, Q, A, C, K, F, P, D, E, R, H

Inorder: Q, B, K, C, F, A, G, P, E, D, H, R

i. Draw the diagram of T.

ii. Find the depth d of T.

iii. Find the descendants of B.

iv. List the terminal nodes of T.

✓

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
- iv) All symbols represent their usual meaning

### Section-A

1. a) State the Ohm's law. Mention the main characteristics of series and parallel circuits. 2
- b) Find the values of  $V_1$ ,  $V_2$ , and  $V_3$  from the following circuit in figure- 1(b). 3

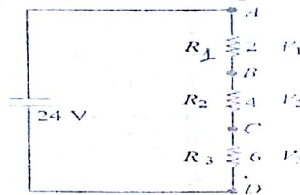


Figure- 1(b)

- c) Find the Norton's equivalent circuit for the network in figure-1(c) and current ( $I_2$ ) through the resistor  $R_2$ , where  $E_1 = 120V$ ,  $E_2 = 180V$ ,  $R_1 = 40\Omega$ ,  $R_2 = 12\Omega$ ,  $24\Omega$ ,  $36\Omega$  and  $R_3 = 60\Omega$ . 5

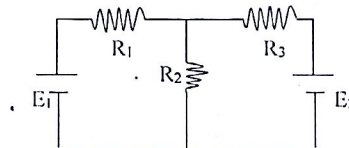


Figure-1(c)

2. a) Find the Thevenin's equivalent circuit and current through the  $R_3 = 7\Omega$  for the network in figure-2(a). 4

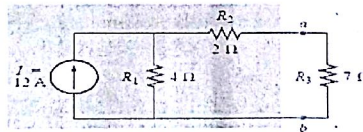


Figure-2(a)

- b) Explain the Kirchhoff's voltage law and Kirchhoff's current law with proper circuit examples. 2



- c) What is power factor? Determine the average power dissipated in a network whose input current and voltage are the following:

$$i = 5 \sin(\omega t + 40^\circ)$$

$$v = 10 \sin(\omega t + 40^\circ)$$

3. a) In the network of figure-3(a), using Reciprocity theorem, find (i) ammeter current when battery is at A and ammeter at B and (ii) when battery is at B and ammeter at point A. Also calculate the transfer resistance.

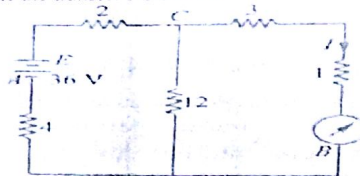


Figure-3(a)

- b) Write down the application of filter circuits. Classify the filter circuits.  
c) For the following pairs of voltage and current, determine whether the element involved is a capacitor, an inductor or a resistor. Determine the value of C, L, or R if sufficient data are provided.

$$v = 1000 \sin(377t + 10^\circ)$$

$$i = 5 \sin(377t - 80^\circ)$$

4. a) Find the voltage across and current through the load resistor  $R_L$  in the circuit of figure-4(a) using Millman's theorem.

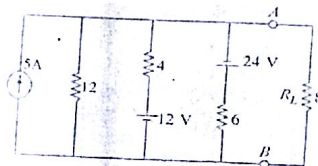


Figure-4(a)

- b) Prove that  $I_{rms} = 0.707 I_m$ .  
c) What is the phase relationship between the following waveforms:

$$v = 10 \sin(\omega t + 30^\circ)$$

$$i = 5 \sin(\omega t + 70^\circ)$$

### Section-B

5. a) Prove that average power  $P = V_{rms} I_{rms} \cos(\theta)$ . Find the real power for resistor and inductor.  
b) Describe the complex quantity with example.

- c) Design a high-pass RL filter that has a cutoff frequency of 4 kHz when  $R = 3 \text{ k}\Omega$ . Calculate the inductor of inductance  $L$ . 3
6. a) State the maximum power transfer theorem. Prove that for maximum power transfer, load resistance  $R_L$  must be equal to the internal resistance  $R_i$  of the source. 4
- b) An audio amplifier produces an alternating output of 12V before the connection to a load. The amplifier has an equivalent resistance of  $15\Omega$  at the output. What resistance the load needs to have to produce maximum power? Also calculate the power output under this condition. 4
- c) Define the peak amplitude and peak-to-peak value of a waveform. Mention the tasks of function generator. 2
7. a) Use Millman's theorem, to find the common voltage across terminals A and B and the load current in the circuit of figure-7(a). 4

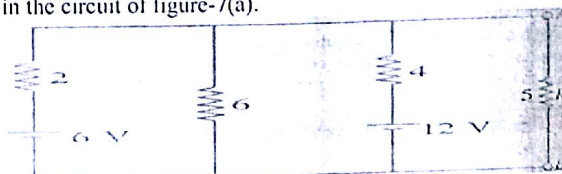


Figure-7(a)

- b) Show that if the source current leads the applied voltage, the network is predominantly capacitive, and if the applied voltage leads the source current, the network is predominantly inductive. 4
- c) The current through a  $5\Omega$  resistor is given. Find the sinusoidal expression for the voltage across the resistor for  $i = 40 \sin(377t + 30^\circ)$ . 2
8. a) In figure-8(a), let battery e.m.f.s. be 6 V and 12 V, their internal resistances  $0.5 \Omega$  and  $1 \Omega$ . The values of other resistances are as indicated. Find the different currents flowing in the branches and voltage across  $6 \Omega$  resistor using Superposition theorem. 5

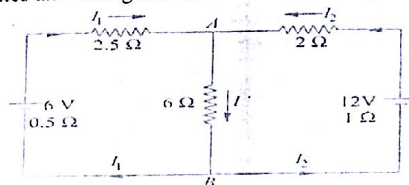


Figure-8(a)

- b) Write about low pass, high pass and band pass filters. 2
- c) What is phasor? Perform the following division and leave the answer in rectangular form. 3

$$(8 + j8)/(2 + j2)$$

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**Bangabandhu Sheikh Mujibur Rahman Science & Technology University**  
Department of CSE

1<sup>st</sup> Year 1<sup>st</sup> Semester B.Sc. (Hons.) Examination 2016

Course No.: MAT104

Course Title: Algebra, Trigonometry and Vector

Full Marks: 60

Time: 03 Hours

N.B. 1) The Figures in the right margin indicate full marks.

2) Answer any THREE of the following questions of each section.

**SECTION A**

1. (a) Define union and intersection of sets. 2  
 (b) State and prove De-Morgan's laws. 4  
 (c) Solve the system of linear equations by using Cramer's rule 4  

$$\begin{aligned} 2x + 3y - 4z &= 0 \\ x + 2y - 3z &= 1 \\ 5x + 7y - z &= 6. \end{aligned}$$
2. (a) State and prove the fundamental theorem of algebra. 5  
 (b) Solve the equation  $6x^3 - 11x^2 + 6x - 1 = 0$ , the roots being in H.P. 5
3. (a) State and prove De-Moivre's theorem. 5  
 (b) Find all the values of  $(1+i)^{\frac{1}{8}}$ . 5
4. (a) Sum to n terms the series 5  

$$\frac{1}{\cos \alpha + \cos 3\alpha} + \frac{1}{\cos \alpha + \cos 5\alpha} + \frac{1}{\cos \alpha + \cos 7\alpha} + \dots$$
  
 (b) Show that  $\frac{\pi}{8} = \frac{1}{1.3} + \frac{1}{5.7} + \frac{1}{9.11} + \dots$  5

**SECTION B**

5. (a) Define vector, scalar and unit vector. Find a unit vector parallel to the resultant of vectors  $\vec{A} = 2i + 4j - 5k$ ,  $\vec{B} = i + 2j + 3k$ . 5  
 (b) Find the angle between the vectors  $(2i + 6j + 3k)$  and  $(12i - 4j + 3k)$ . 5
6. (a) Find the angles which the vector  $\vec{A} = 3i - 6j + 2k$  makes with the coordinate axes. 3  
 (b) Find the projection of the vector  $\vec{A} = i - 2j + k$  on the vector  $\vec{B} = 4i - 4j + 7k$ . 3  
 (c) Determine (i)  $(\vec{A} \times \vec{B}) \times \vec{C}$ , (ii)  $\vec{A} \times (\vec{B} \times \vec{C})$ , for which 4  
 $\vec{A} = 3i - j + 2k$ ,  $\vec{B} = 2i + j - k$ , and  $\vec{C} = i - 2j + 2k$ .
7. (a) If  $\vec{A} = t^2i - tj + (2t+1)k$  and  $\vec{B} = (2t-3)i + j - tk$ , then find 3  
 (i)  $\frac{d}{dt}(\vec{A} \cdot \vec{B})$ , (ii)  $\frac{d}{dt}(\vec{A} \times \vec{B})$ .  
 (b) Show that  $\vec{A} \cdot \frac{d\vec{A}}{dt} = |\vec{A}| \cdot \left| \frac{d\vec{A}}{dt} \right|$  3  
 (c) Define gradient, divergence and curl. If  $\phi(x, y, z) = 3x^2y - y^3z^2$ , then find  $\nabla \phi$  at the point  $(1, -2, -1)$ . 4
8. (a) Using Divergence theorem evaluate  $\iiint_V (x dy dz + y dz dx + z dx dy)$  where S is the 5  
 position of the plane  $x + 2y + 3z = 6$  which lies in the first Octant.  
 (b) State and prove Stoke's theorem. 5



Full Marks: 60

Times: 3 Hours

N.B.

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

### SECTION-A

1.
  - a) Write a C program with all possible parts describe each parts. 4
  - b) Draw flow chart of "how source code turns into machine code". 4
  - c) What is identifier? Write rules of declaring identifier. 2
2.
  - a) How different data types stored in computer memory. 3
  - b) What will be the output
 

```
main()
{
    char *p1="name";
    char *p2;
    p2 = (char*)malloc(20);
    memset(p2, 0, 20);
    while(*p2++ = *p1++);
    printf("%s\n", p2);
}
```

3
  - c) What will be the output
    - i) main()
 

```
{ int x=5;
    printf("%d,%d,%d\n",x,x<<2,>>2);
}
```
    - ii)
 

```
main()
{ char *ptr = "Tech Preparation";
  *ptr++; printf("%s\n", ptr);
  ptr++;
  printf("%s\n", ptr);
}
```2
  - d) How you dynamically allocate memory and used it as array using pointer give example? 2
3.
  - a) What is the output of the following program: 3

```
#include <stdio.h>
int main(void) {
    printf("%d", 7/2);
    printf(" %d", 6/2);
    printf(" %d", 6%2);
    printf(" %d", 7%2);
    return 0;
}
```
  - b) What does static variable mean? Advantages of a macro over a function? 3
  - c) Which bit wise operator is suitable for checking whether a particular bit is on or off? 2
  - d) What will be output of following c code? 2

```
void main()
{
    struct bitfield
    {
        unsigned a:5;
        unsigned c:5;
        unsigned b:6;
    } bit;
    char *p;
    struct bitfield *ptr, bit1={1,3,3};
    p = &bit1;
    p++;
    clrscr();
    printf("%d", *p);
    getch();
}
```
4.
  - a) What is wrong with the following function? 2

```
void func(void) {
    int i;
    printf("Enter a number: ");
    scanf("%d", &i);
    return i;
}
```
  - b) Write a program to display the following series. 4

999 996 993 990 ... 12 9 6 3



- c) There are 8 ounces in a cup. Write a program that converts ounces to cups. Use a function called `o_to_c()` to perform the conversion. Call it with the number of ounces and have it return the number of cups.

#### SECTION-B

- 5 a) What is static memory allocation and dynamic memory allocation? 2  
b) Difference between arrays and pointers? 2  
c) Predict the output or error(s) for the following: 6

```
i) void main()
{
    int const *p=5;
    printf("%d",++(*p));
}

ii) main(){ char s[ ]="man";
        int i;
        for(i=0;s[ i ];i++)
            printf("\n%c%c%c%c",s[ i ],*(s+i),*(i+s),i[s]);
        }

iii) main()
{
    static int var = 5;
    printf("%d ",var--);
    if(var)
        main();
}

iv) #define int char
main()
{
    int i=65;
    printf("sizeof (i) =%d", sizeof (i));
}
```

6. a) Can a function return multiple values to the caller using return? 2  
b) What is the purpose of `#undef` preprocessor? 2  
c) Can variables belonging to different scope have same name? If so show an example. 2  
d) Find power of a number using recursion using c program 4

7. a) What will be the output of this section 2

```
main()
{
    int c[ ]={2.8,3.4,4,6.7,5};
    int j,*p=c,*q=c;
    for(j=0;j<5;j++) {
        printf(" %d ",*c);
        ++q; }
    for(j=0;j<5;j++){
        printf(" %d ",*p);
        ++p; }
}
```

- b) What is the difference between Call by Value and Call by Reference? 2  
c) What are header files and what are its uses in C programming? 2  
d) What will be output of following c code? 4

```
i) #include<stdio.h>
int main(){ int i=2,j=2;
            while(i+1?--i;j++)
                printf("%d",i);
            return 0;
        }

ii) #include<stdio.h>
int main(){ static int i;
            for(++i;++i;++i) {
                printf("%d ",i);
                if(i==4) break;
            }
            return 0;
        }
```

```
iii) #include<stdio.h>
int main(){ int i=5;
            int a=++i + ++i + ++i;
            printf("%d",a);
            return 0;
        }
```

- 8 a) is it possible to create your own header files? Give example. 3  
b) What is structure and union? How memory are assigned for them. How you access the members. 3.5  
c) Add  $1+3+5+\dots+n$ th term using recursive function. 3.5