University of Rajshahi
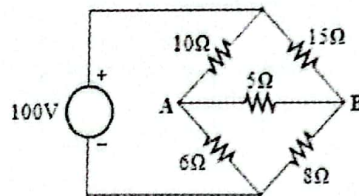### Department of Computer Science and Engineering
B.Sc. Engg. (CSE) 1ˢᵗ Year Odd Semester 2016
Course: APEE 1131 (Electrical Circuits and Electronics)
Time: 3 Hrs.   Full Marks: 52.5
[N.B. Answer SIX questions taking at least THREE from each Section.]

Part A

1(a) State and explain maximum power transfer theorem.   4
 (b) Apply Thevenin's theorem to calculate the current through the 5Ω resistor of the circuit   4.75
    below:

2(a) State and explain Kirchoff's current law with a suitable example.   3
 (b) Distinguish between Thevenin's and Norton's theorem.   2
 (c) Apply Norton's theorem to calculate current flowing through the terminal AB of the figure   3.75
   below:
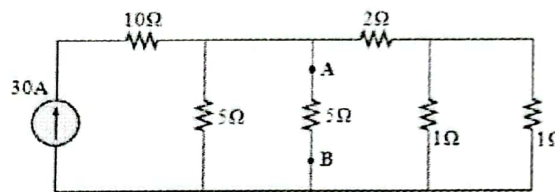
3(a) What are the different kinds of Filter? Explain each type with frequency response curve.   3
 (b) Find out the characteristics impedance of a symmetrical T-section network.   2.75
 (c) Draw and discuss the circuit diagram of a T-section low pass filter and find out its cut off   3
    frequency.

4(a) What is a rectifier? How can you use a junction diode as a rectifier?   2.75
 (b) Briefly discuss the operation of a full wave bridge rectifier. Show the effect of a shunt   3
    capacitor in the rectifier.
 (c) Explain the V-I characteristics of a zener diode.   3

Part B

5(a) Draw the circuit diagram of an npn transistor in CE configuration and discuss its input and   3.75
    output characteristics.
 (b) What is load line? Show the importance of load line with proper diagram.   2
 (c) Show the relationship between α and β.   1
 (d) What is thermal Runaway? Define stability factor.   2

6(a) What do you understand by transistor biasing? Why is it needed?   2
 (b) Draw the diagram of a base bias with emitter feedback circuit and explain its operation.   4

(c) In figure $V_{CC}=12V$, $V_{BE}=0.7V$, $R_L=1K$ ohm, $R_B=100K$ ohm and $\beta=100$. Now Find I_C, V_{CE}, 2.75 I_B and stability factor.
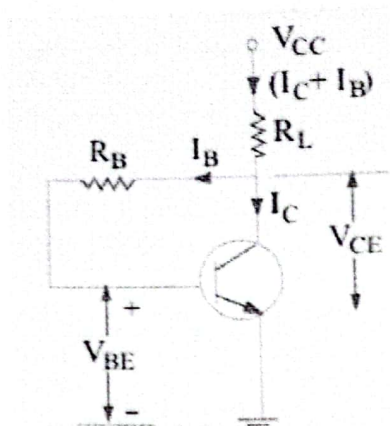
7(a) What is feedback? Discuss the principle of a feedback amplifier.   3
 (b) What is an oscillator? Define damped and undamped oscillations.   2
 (c) Design a bistable multivibrator and discuss its operation.   3.75

8(a) What is CMRR? Write down some characteristics of an ideal Op-Amp.   1.75
 (b) How an Op-Amp can be used as an integrator? Explain.   4
 (c) What is inverting and non-inverting amplifier? Explain with necessary figures.   3

Dept. Computer Science and Engineering
University of Rajshahi
Semester Final Examination, B.Sc. Engg. 2016, 1st year, Odd semester,
Course ID: CSE -1121   Course Title: Computer Programming with C
Total Time 3 Hours   Total Marks 52.5
Answer any **six** questions taking **three** from each section

Section A

1(a)   (i)   If int i = 7, float f = 5.5, char c = 'a, What will the output of   (a) 'i + c' and (b) 'i + f'   3
        (ii)   If int result, i = 7, f = 8.5, What will the output of ' result = (i + f) % 4'
        (iii)   If float num = 10.5, What will the output of   'num % 2' and '((int)num) % 2'

(b)   What will be simplified form of (a) !(a<b) , (b) !(c<=d), (c) !(x=>y) ?   1.5
(c)   What will be the output of the following code?   4.25
       (Objective of the question: To check the formatting knowledge)

```
#include<stdio.h>
#include<conio.h>

 main()
{
    printf("%7d\n",123);
    printf("%-4d\n",123);
    printf("%07d\n",15);
    printf("%4.3f\n",3.14159);
    printf("%x\n",127);
    printf("%o\n",127);
    getch();
}
```

2(a)   What will be the output of the following code?   2.75

```
#include<stdio.h>
#include<conio.h>

int i,j;
main()

{
  i=1;
  while(i<=5)
  {
  for (j=1; j<=6; j++)
    {if (i==j)
      printf("X");
     else
      printf("Y");
    }
    i=i+1;
    printf("\n");
  }

}
```

(b)   List the syntax error (if any) of each line of the following code?   6
       (Objective of the question: To check the knowledge of basic C syntax)

```
#include <conio.h>
int 1x,2x, y1,y2;
float z;
char a[10], b[10];
Main()
{
scanf("%d%d%f",y1,z);
scanf("%c%c%c), &a[1],a[2],&a[3]);
b[2]=a[2];
```

```c
    y2=b[2]+a[1]+y1;
    printf("%f%f%f%d%d",&y1,z,y2,z,a[3]);
    }
```

3(a) What is the difference between 'while' and 'do-while' loops?

(b) What will be the output of the following program?
(Objective of the problem: The check the capacity of four-layer nested loop control)

```c
#include<stdio.h>
#include<conio.h>

int x[5][5]={   {1, 4, 3, 6, 8},
                {2, 9, 0, 5, 7},
                {5, 9, 6, 7, 6},
                {9, 0, 2, 6, 8},
                {3, 6, 0, 1, 7} };

int i,j,k,l, tmp,big,p;

main() {

for (i=0;i<=4;i++)
  {
    for(j=0; j<=4; j++)
    {
      for(k=j; k<=4; k++)
      {
        for(l=k ; l<=4; l++)
        {
        x[k][l]=x[k][l]+1;
        }
      }
    }
  }


for (i=0;i<=4;i++)
  {
    for(j=0; j<=4; j++)
    {
      printf ("%d ",x[i][j]);
    }
    printf ("\n ");
  }

getch();
}
```

4(a) What is the purpose of the switch statement? How does this statement differ from the other statements? 2.5

(b) What is the difference between the break and continue statement? 2.5

(c) Write a fragment of program that makes use of the goto statement. 3.75

Section-B

5(a) What are the advantages of using functions? 2

(b) What are the differences between passing an array to a function and passing a single-valued data item to a function? 2

(c) What will be the output of the following code? If you think any value displayed may be garbage, mention it as garbage too. Explain how the variables take the values.
(Objective of the question: To check the concepts of local and global variables) 4.75

```c
#include<stdio.h>
#include<conio.h>
```

```c
void add_int(int n);

int x,p,q;

int main(){
    Int p;
    q=200;
    x=10;
    printf("\nBefore calling x=%d  p=%d  q=%d",x, p, q);
    add_int(x);
    printf("\n After calling x=%d  p=%d  q=%d",x, p, q);

}

void add_int(int x){
    x=50;
    p=200;
    q=300;
    }
```

6(a) What conditions must be satisfied by all of the elements of any given array?   1.75

(b) What will be the output of the following code   5
(Objective of the question: Check the concepts of pointers)

```c
void func1(int *p, int *q, int *r, int *s);

main() {
    int a,b,c,d,*x,*y;

    a=15; b=100; x=&d; y=&c; c=25; d=300;
    printf("Before calling  %d %d %d %d\n",a,b,*x,*y);
    func1(&c,&d,&a,&b);
    printf("After calling  %d %d %d %d\n",a,b,*x,*y);
    getch();
}

void func1(int *x1, int *x2, int *x3, int *x4)
{
    *x1=100; *x2=200; *x3=300; *x4=400;
}
```

(c) Can entire arrays be processed with single instructions, without repetition?   2

7(a) Write a program to read a n bit long binary stringand then search how many times pattern '000' occurs. Do not considersame '0' in two adjacent '000' pattern. For example '100001' or 1000001' has only one '000' pattern, but '100000001' has two '000'.   3.5

Sample input: 101000111001000010110000010000001110
Output: 5

(b) What will be the output of the following code?(Objective of the question: To check the knowledge of recursive function)   5.25

```c
#include<stdio.h>
#include<conio.h>

int y(int n);

int main(){
    int x;
    x=y(50);
    printf("Final Output=%d",x);
    getch();
}

int y(int n){
```

```c
if(n==0)
    {
    printf("In Terminating Condition= %d \n",n);
        return n;

    }
else
        { printf("In Recursive Calling =%d\n", n);
        return n+y(n-5);

        }
    printf("CSE %d Times\n",n);

}
```

2.75
6

8(a) Draw the 'flow chart' to find out the 'biggest number' from given 10 integers.

(b) Write C program for the following problem, it does not need to think about run-time optimization.
(Objective of the question: To check the problem understanding capacity)

One day, one of the students of CSE dept. named Sumon is having a party, and he has invited his friends, p of them have arrived already, but some other are runninglate. To occupy his guests, Sumon tried playing some team games with them, but he found that it wasimpossible to divide the p guests into any number of equal-sized groups of more than one person.As a result, he had to wait until q guest(s) arrived, q may be single guest or group of guests arrived at the same time. Finally, summon could make teams of equal sized from the arrived (p+q) guests and started his games.

Sample Input
The input will consist of 5 test cases. Each test case will be given as a non-negative integer (p+q) and (p+q)<=50;

Sample Output
For each test case, output will be an integer q that is closest to (p+q)..

Sample Input	Corresponding Output
8	1
22	3

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg.(CSE) 1st Year 2016
Course: MATH1111(Algebra, Trigonometry and Vector)
Time: 3 Hrs.   Full Marks: 52.5

[N.B. Answer SIXquestions taking at least THREE from each part.]

Part A

1.a) Define null set, subset, power set, union and intersection of two sets with example. 3

 b) Define one-one and onto functions. Can a constant function be one-one? Justify your answer. Show   3
   that if a relation R is transitive, then its inverse relation R^{-1} is also transitive.

 c) Use Cramer's rule to solve the system of linear equations: $x + y + z = 3, \ x + 2y + 3z = 6, \ 5x + 8y + 11z = 24$.   2.75

2.a) Show that in an equation with real coefficients imaginary roots occurs in pairs.   3

 b) Solve the equation $54x^3 - 39x^2 - 26x + 16 = 0$, the roots being in geometrical progression.   3

 c) In the equation $x^4 - x^3 - 7x^2 + x + 6 = 0$, find the value of S_4.   2.75

3.a) If a,b,c are the roots of $x^3 + qx + r = 0$,find the equation whose roots are $bc + \frac{1}{a}, ca + \frac{1}{b}, ab + \frac{1}{c}$.   2

 b) Solve the cubic equation $x^3 - 15x^2 - 33x + 847 = 0$ by Cardan's method.   3.75

 c) If $x = cos\theta + isin\theta$ and $1 + \sqrt{1 - a^2} = na$ then prove that $1 + acos\theta = \frac{a}{2n}(1 + nx)(1 + \frac{n}{x})$ 3

4.a) If $x = \frac{2}{1!} - \frac{4}{3!} + \frac{6}{5!} - \frac{8}{7!} + \cdots \dots \dots to \infty$ and $y = 1 + \frac{2}{1!} - \frac{2^3}{3!} + \frac{2^5}{5!} - \cdots \dots \dots to \infty$ then show   3
that $x^2 = y$.

 b) If$i^{i^{...... adinf}} = A + iB$, then prove that $tan\frac{\pi A}{2} = \frac{B}{A}$ and $A^2 + B^2 = e^{-\pi B}$.   2.75

 c) Find the sum to infinity of the series $sin\theta . sin\theta - \frac{1}{2}sin2\theta . sin^2\theta + \frac{1}{2}sin3\theta . sin^3\theta \dots \dots \dots \dots \dots$ 3

Part B

5.a) Define dot product of two vectors $\vec{A}$ and $\vec{B}$. Prove that the area of a parallelogram with sides $\vec{A}$ and   3
$\vec{B}$ is $|\vec{A} \times \vec{B}|$.

 b) Determine the unit vector perpendicular to the plane of $\vec{A} = 2\vec{i} - 6\vec{j} - 3\vec{k}$ and $\vec{B} = 4\vec{i} + 3\vec{j} - \vec{k}$.   2.75

 c) Show that the vectors $\vec{A} = 3\vec{i} - 2\vec{j} + \vec{k}, \vec{B} = \vec{i} - 3\vec{j} + 5\vec{k}$and $\vec{C} = 2\vec{i} + \vec{j} - 4\vec{k}$ form a right-   3
   angled triangle.

6.a) Find a unit tangent vector to any point on the curve $x = t^2 + 1, \ y = 4t - 3, \ z = 2t^2 - 6t$. Also   2.75
   determine it where *t=2*.

 b) A particle moves on a curve so that its position vector is given by $\vec{r} = coswt\vec{i} + sin wt\vec{j}$, where w 3
is a constant. Show that the velocity of the particle is perpendicular to $\vec{r}$and the acceleration is directed
towards the origin.

 c) What is the physical significance of the curl of a vector field? Determine the value of λ so that the   3
vector field $\vec{v}(x, y, z) = (x + 3y)\vec{i} + (y - 2z)\vec{j} + (x + \lambda z)\vec{k}$is solenoidal.

7.a) What is meant by $\vec{\nabla}\varphi$, where φ is a scalar field? Find a unit normal to the surface   3
   $x^2y + 2xyz = 4$ at the point *(2, -2, 3)*.

 b) Find angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point *(2, -1, 2)*.   2.75

 c) Find the volume of the region common to the intersecting cylinders $x^2 + y^2 = a^2$ and   3
$x^2 + z^2 = a^2$.

8.a) State the divergence theorem of Gauss. Verify Green's theorem in the plane for   4.75
   $\oint_c (x^2 - 2xy)dx + (x^2y + 3)dy$ around the boundary of the region defined by $y^2 = 8x$ and
   x=2.

 b) Verify Stroke's theorem for $\vec{A} = (y - z + 2)\vec{i} + (yz + 4)\vec{j} - xz\vec{k}$, where S is the surface of the   4
cube $x = 0, y = 0, z = 0, x = 2, y = 2, z = 2$ above the *xy* plane.

Answer six questions taking any three questions from each section

SECTION: A

---

1 (a) State and explain Faraday's laws of electrolysis. Describe experiments by which the first law can be verified.   3+2

   (b) State and explain the principle of independent ionic migration.   2

   (c) Equivalent conductance at infinite dilution of NaCl, HCl and CH_3COONa are 126.45, 426.16 and 91.0 S 1.75
     $cm^2 \ eq^{-1}$, respectively. Find the equivalent conductance of acetic acid at infinite dilution.

2 (a) Define chemical equilibrium. Why chemical equilibrium is called a dynamic equilibrium?   1+2

   (b) State and explain the law of mass action.   2

   (c) State and explain Le Chatelier's principle. Discuss its application to the following: 3.75

     (i). $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ $\Delta H = -5.56 KJ$

     (ii). $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $\Delta H = -5.78 KJ$

3 (a) What do you understand by the rate of a reaction? Mention the factors that affect the rate of a reaction. 1+1

   (b) What is meant by order of a reaction? Derive integrated rate equation first order reaction. 1+3

   (c) What is meant by the energy of activation and how is it determined?   2.75

4 (a) Define physical adsorption and chemical adsorption. Distinguish between physical adsorption and 2+2
     chemical adsorption.

   (b) Write down Langmuir assumptions of adsorption and deduce an expression for Langmuir's monolayer 3.25
     adsorption isotherm.

   (c) Explain the terms: colloids and crystalloids.   1.5

SECTION: B

---

5 (a) Derive an expression for the radius of nth orbit of H-atom.   3

   (b) Find out the frequency in terms of wave numbers ($\bar{v}$) for the 2nd spectral line of Lyman series. Given 2
     that $R_H = 1.097 \times 10^7 m^{-1}$.

   (c) State and explain the 'Hund's rule of maximum multiplicity' with suitable example.   2

   (d) What are quantum numbers? What is the subshell designation for each of the following cases? 1.75
     (i) n=2, l=0; (ii) n=5, l=1 and (iii) n=4, l=3.

6 (a) What are s and p block elements? Mention the main characteristics of s and p block elements? 3

   (b) Define ionization energy. The first ionization energy of nitrogen is higher than that of oxygen-explain. 3

   (c) What is ionic bond? What are the conditions for the formation of ionic bonds?   2.75

7 (a) What is 'octet rule'? Draw the Lewis (or electorn-dot) structure of the following molecules/ion: PH_3, 1.75
     $SiCl_4$, NO, SO_4^{2-}.

   (b) Draw the MO energy level diagram for O_2 molecule and explain why it is paramagnetic? Find out its 3
     bond order.

   (c) Explain why H_2O is liquid whereas H_2S is gas at NTP.   2

   (d) Deduce the shape of $BeCl_2$ and PF_5 molecules with the help of hybridization concept. 2

8 (a) What are lanthanides? Discuss their position in the periodic table?   1.75

   (b) Write the ground state electronic configuration of the following metals/ions: Cr(24), Cu(29), Co^{2+}(27), 2
     Ni^{2+}(28).

   (c) Explain any two of the following: 5

     (i). Cu^{2+} complexes are colored while those of Zn^{2+} are colorless;

     (ii). Transition metals show variable oxidation states;

     (iii). Fe^{3+} is more stable than Fe^{2+}.

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. Part-1 Odd Semester, Examination-2016
Course: ENG-1111 (Technical and Communicative English)

Time: 2 Hours

Full Marks: 35

Answer **four** questions taking any **two** questions from each section

SECTION: A

1   a)   Frame two sentences using the modal auxiliaries "May" and "Can", both of the sentences will have the meaning of permission.   3.75

  b)   Complete the following sentences with appropriate models. Use negative where necessary (any five)   5
    (i).   He worked hard so that he___ shine in life.
    (ii).   He ___ come because he was sick.
    (iii).   ___ you prefer tea?
    (iv).   Abir is educated. He ___ read and write.
    (v).   Good health is a ___ to lead a happy life.
    (vi).   I hoped I ___ succeed.
    (vii).   He ___ rather die than beg.

2   a)   Write sentences using the following idioms and phrases (any five).   5
    (i).   A bad egg.
    (ii).   Bad book.
    (iii).   Call to account.
    (iv).   Cut and dried.
    (v).   Eye to eye.
    (vi).   Get rid of.

  b)   Define suffix and prefix.   0.75

  c)   Add suffix with the root/base words to make a new word (any three).   3
    (i).   Amuse.
    (ii).   Conquer.
    (iii).   Abolish.
    (iv).   Subrest.

3   a)   Complete the passage by selecting the word(s) that best fit the context of the passage: 5.75

  Plants grow almost everywhere on our planet. Plants need the same things to live. The four things plants need are (food, shelter, water and sunlight/ light, water, air and soil/ a pot, watering can, a shovel and seeds). The (roots/ stem/ leaves/ flower) are underground. This is the part of the plant that takes in (sunlight/ water and nutrients/ leaves/ stems) from the soil. The (roots/ stem/ leaves/ flower) connects the roots with the leaves. The trunk of a tree is a good example of this part of a plant. This part carries (sunlight/ water and nutrients/ soil) from the roots to other parts of the plant. The (roots/ stem/ leaves/ flower) are the parts of the plant that grow out of the stem. They take in (soil/ flower/ nutrients and light).

  b)   Change the following sentences to Passive voice.   3
    (i).   Arisha generously donated money to the homeless shelter.
    (ii).   The winning team will celebrate their victory tomorrow.
    (iii).   The cleaning crew vacuums and dusts the office every night.

8.75

4   Read the following passage carefully and answer the questions that follow:

When you hear the words waves and currents, your brain might immediately make you think about the ocean, or at least some form of water. That's natural, since that is probably what you have experienced the most in connection to those two words. But waves and currents can be talking about energy as well. Energy travels in waves, and electric current is the constant flow of electric energy.

A wave, whether it is in the ocean, on land, or in the air, is simply the movement that takes energy from one place to another. Many kinds of energy travel in waves. Light, sound, and mechanical energy all travel in waves. Sound waves, for example, are produced by the vibration of particles. Plucking a string on a guitar or violin makes the air around the string move back and forth.

A wave can be measured based on a comparison of its highest point (crest) and lowest point (trough). The distances between troughs and the distance between crests are called wavelengths. You can use a timer to see how many crests happen in a certain amount of time, and that will tell you the frequency of a wave.

The constant flow of charged particles is an electric current. Negatively charged particles move toward positively charged particles. Electric current needs an unbroken path, or circuit. A circuit is made of wires, an energy source and something that requires energy. Then the current can flow!

(a) What is a wave? How are ocean waves and sound waves similar?
(b) What is a trough? How is it different than a crest?
(c) How can you measure the frequency of a wave?
(d) What is the name for the flow of charged particles?

5   a) Write a paragraph on any one of the following: 4
         (i).   Internet.
         (ii). Bangla noboborsho.
         (iii). Cyber crime.
     b) Write an application to your chairman for some supporting fund for your study tour.   4.75

6   (a) Write a "short report" on 3D model as an assignment of engineering drawing lab.   4.75
     (b) Write a letter to your mother describing her your newly admitted educational institution.   4