First Year B.Sc (Hons.) Incourse (Second) Examination 2011
Course No. MATH 1124 : Calculus
Department of Computer Science and Engineering
Full Marks : 25 Time : 1 (One) hour

N.B. : Answer the following questions.

1. What is the difference between $\lim_{x\to x_0} f(x)$ and $f(x_0)$. 2

2. Evaluate : (a) $\lim_{x\to 2} \frac{|x-2|}{x-2}$; (b) $\lim_{x\to 3} f(x)$, where $f(x) = \begin{cases} x^2-5 & if \quad x \le 3 \\ \sqrt{x+13} & if \quad x > 3 \end{cases}$.

(c) $\lim_{x\to 0} \frac{\tan x - \sin x}{x^3}$. 9

3. Define the continuity of a function f at a point $x = x_0$. Make f as a piecewise function, and then discuss the continuity of f at $x = 1$, where f is defined by $f(x) = |x-1|$. 8

4. Compute $\frac{dy}{dx}$: (a) $y = \sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$; (b) $y = x^{\sin x}$. 6

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N.B. : Answer the following questions.

1. (a) What is a function f from a non-empty set X to another non-empty set Y. Give two examples of functions.

   (b) Is $y^2 = x^4$ a function of x? Justify your answer.

2. Define the domain and range of a function. Compute the domain and range of the following functions defined by

   (i) $f(x) = 16 - x^2$; (ii) $g(x) = \sin x + |\sin x|$; (iii) $h(x) = 2\cosh x + 1$.

   Hence, sketch them.

3. Compute the composition function $(f \circ g)(x)$ where $f(x) = \sqrt{x-2}$, $g(x) = x + 1$.

4. Define the inverse function of a function. Find the inverse of $f(x) = \tan x, -\pi/2 < x < \pi/2$.

5. Define exponential function.

2nd In-course exam; Session 2010-2011
Course: Physics; Course Code: 1122
Dept. of Computer Science and Engineering,
University of Dhaka
Time: 45 Minutes, Total Marks: 12

Answer All the Questions

Q. 1 State and explain the Carnot's theorem. 4

Q. 2 Prove that a simple shear θ is equivalent to two equal strains of $\frac{\theta}{2}$, an extension and a compression, at right angle to each other. 4

Q. 3 Mention how Miller Index is set for any plane of a Crystal structure. Explain it with proper diagram and example. 4

Department of Computer Science and Engineering, University of Dhaka
Mid-term examination, Session: 2010-2011
Time: 45 Minutes, Marks: 15

Answer all the questions:

Q 1. Prove that the total energy of an object moving in simple harmonic motion is proportional to the square of the maximum displacement of that object. 6

Q 2. Two same types of wave having maximum amplitude of 2 cm, frequency of 1KHz, moving opposite to one another with a velocity of $3X10^8$ m/s. Find the expression for the complex wave, distance between two adjacent anti-node positions of the complex wave. 5

Q 3. Draw time diagrams of the following equation $y = y_m e^{nt} \sin(\delta - \omega t)$ 4

a) n= any negative number, time period T= 2 ms and $\delta = 45$ degree
b) n= any positive number, Time period T = 4ms and $\delta = 90$ degree

1. Find the color code for a 220Ω resistor with 10% tolerance.
2. How long must a steady current of 2A exist in a resistor that has 3V across it to dissipate 12J energy?
3. If two systems in cascade each have an efficiency of 80% and the input energy is 60J, what is the output energy?
4. Find the unknown resistance R of the network in Figure 1.

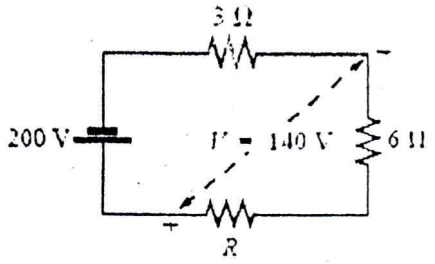

Figure 1

5. Determine the unknown currents I_1, I_2, I_3 in Figure 2.

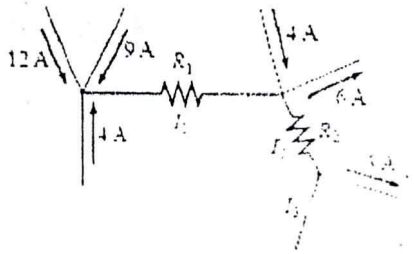

Figure 2

6. For Figure 3:
   i. Calculate R_T
   ii. Determine I and I_1
   iii. Find V_3

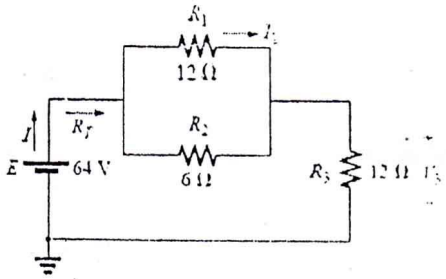

Figure 3

7. Convert the network in Figure 4 into a single source network and find the voltage drop across R2.

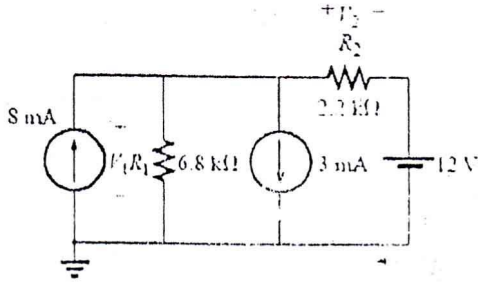

Figure 4

!! Best of Luck !!

Department of Computer Science and Engineering

University of Dhaka

Chemistry Incourse I

Full Marks: 30 **Time 1h**

Answer All Question

1. (a) Write the postulates of Bohr's atomic model 2
   (b) (In C.G.S units). Calculate the excitation energy for the electronic transition from state $n = 1$ to state $n = 2$ in a hydrogen atom ($h = 6.626 \times 10^{-27}$ erg-s, $e = 4.803 \times 10^{-10}$ esu, $m = 9.109 \times 10^{-23}$g) 2
   (d)Explain the multiplicity of the spectral line of a hydrogen atom. 1
   (e)State (i) Pauli's exclusion principle, (ii) Heisenberg's uncertainty principle 2
   (f) Show the electronic configuration of Cr and explain why it has $3d^5 4s^1$ instead of $3d^4 4s^2$ configuration 2
   (g) Find the values of all quantum numbers for the 19^{th} electron in chromium. 1

2. (a) In which group would you place an element having $2s^2 2p^2$ outermost electronic configuration. 1
   (b) Explain why Fe^{2+} is less stable than Fe^{3+} ion. 1
   (c) Define (i) electron affinity,(ii) electronegativity 2
   (d) What is diagonal relationship? Show with example. 1
   (e) What happens to the size of atoms when moving down a group and moving left to right in a period? 2
   (f) Define and give examples of alkali metals and transition metals. 2

3. (a) Find types of bonding ~~with explanation~~ in (i) methane, (ii) magnesium chloride, (ii) diammine silver chloride and (iv) in a piece of gold. 2
   (b) Sodium iodide is soluble in water while silver iodide is not, explain. 2
   (c) Why boiling point of HF is higher than that of HI although the molecular weight of HI is much higher? 2
   (d) Explain why the electrical conductivity of a metal reduces with increasing temperature? 1

4. (a) Identify oxidizing and reducing agents when metallic zinc reacts with copper sulfate to give metallic copper and zinc sulfate. 1
   (b) Find the oxidation number of Cl in $HClO_4$, HClO, Cl_2 and HCl. 2
   (c) Balance the reaction of potassium dichromate and Fe(II) chloride in acidic medium. 1

Department of CSE, University of Dhaka

CSE 1102 : Programming Fundamentals

Incourse Examination I (16 March 2011, 9AM)

Duration: 50 minutes | Set - A | Total: 30

1. What will be the output of the following code snippets: 2+2+2+4=10

a)
```
int v1, v2, v3;
v1 = 5;
v2 = 3;
v3 = v1++ + v2--;
printf("%d, %d, %d\n",v1, v2, v3);
v2 += --v3 + v1++;
printf("%d, %d, %d\n",v1, v2, v3);
v1 *= v2 * v3;
printf("%d, %d, %d\n",v1, v2, v3);
```

b)
```
int x=2, y=17, z=11, result=5;
result -= 2 * z % 13 + y / 3 + x;
printf( "%d\n", result );
```

c)
```
int m = 19;
int n = -37;
int p = 4;
switch(3*m+p)
{
        case 60: m = 88; break;
        case 61: m = 0;
        case 100: n = -40;
        case 48: p = 48;
        case 20: printf("case is 20\n");
                 break;
        default: printf("none\n"); break;
}
printf("%d, %d, %d\n",m,n,p);
```

d)
```
int i=0, j;
while (i < 3)
{
        j = 4;
        while(j >= 0)
        {
                if (j == 2)
                {
                        i++; j--;
                        continue;
                }
                if (i == 2)
                {
                        j -= 2;
                        break;
                }
                printf( "%d %d\n", i, j );
                --j;
        }
        i++;
        printf( "%d %d\n", i, j );
}
```

2. Following are some code snippets that may or may not contain any error(s). If you find any write down the appropriate line number and explain the error clearly. 10

```
1 #include<stdio.h>
2
3 int main()
4 {
5         int y1, x1, y2, x2
6         scanf("%d%d%d%d",x1,x2,y1,y2);
7         z = (x1 + y1)%(x2 + y2);
8         if(x1 > x2 & y1 < x2)
9         {
10                while(i = 45);
11                {
12                        ++i;
13                }
14        }
15        else;
16        {
17                printf("x1 is less than x2);
18        }
19        else (x1==x2)
20        {
21                printf("They are equal\n")
22        }
23
24        return 0;
25 }
```

3. Write a complete C program to accomplish the following tasks: 10

Calculate and print the sum of the following series, where x and n are given as a real number and an integer input respectively. You have to print the result using exactly 4 decimal digits after the decimal point.

$$x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \cdots + \frac{x^n}{n}$$