

**Department of Computer Science and Engineering**  
**First Year First Semester B. Sc Final Examination, 2013**  
**MATH – 1124: Calculus - I**

**Total Marks: 60**

**Time: 2.5 Hours**

**(Answer any Four (4) of the following Questions)**

1. a) Define domain and range of a function  $f(x)$  with at least one example. Sketch and determine the domain and range of the following functions (any two): 7

(i)  $f(x) = |x| + |x + 1|$  (ii)  $f(x) = \frac{1}{x^2 - 4}$  (iii)  $f(x) = \sin x$ .

- b) What do you mean by  $\lim_{x \rightarrow a} f(x)$  and  $f(a)$ ? Test the continuity and differentiability of a function  $f(x)$  at a point  $x = \pi/2$ , where

$$f(x) \begin{cases} 1, & x < 0 \\ 1 + \sin x, & 0 \leq x < \frac{\pi}{2} \\ 2 + \left(x - \frac{\pi}{2}\right)^2, & x \geq \frac{\pi}{2} \end{cases}$$

2. a) Find the differential coefficient  $\frac{dy}{dx}$  of the following functions (any tow): 5

(i)  $y = \tan \ln \sin(e^{x^2})$  (ii)  $y = (2^x + x^2)^{f(x)}$  (iii)  $x = \sin^{-1} \frac{2t}{1+t^2}$ ,  $y = \tan^{-1} \frac{2t}{1-t^2}$

- b) State Leibnitz's theorem. If  $y = \tan^{-1} x$ , then prove that  
 $(1+x^2)y_{n+2} + 2(n+1)xy_{n+1} + n(n+1)y_n = 0$ . 6

- c) A man is walking at the rate of 5 miles per hour towards the foot of a building 40 ft. high. At what rate is he approaching the top when he is 30 ft. from the foot of the building? 4

3. a) State Lagrange's Mean value theorem (MVT). Verify this theorem for  $f(x) = x^3 - x - 4$  on the interval  $[-1, 2]$ . 5

- b) Find the local extrema of  $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 5$ . 5

- c) State L'Hospital rule and compute  $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x}\right)^{\frac{1}{x}}$  5

4. a) Evaluate the following indefinite Integrals: any two 7

(i)  $\int \cos^7 x dx$  (ii)  $\int \frac{\sin x \cos x}{\cos^4 x + \sin^4 x} dx$  (iii)  $\int \frac{dx}{2x^2 + x + 1}$

- b) Evaluate the following definite integrals: 8

(i)  $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x + \sqrt{\cos x}}} dx$  (ii)  $\int_0^4 \frac{x^3}{\sqrt{x^2 + 9}} dx$

5. a) State Taylor's theorem with remainder. Use Taylor's theorem to expand  $f(x) = \frac{1}{x+1}$  in powers of  $x - 3$ . 7

- b) If  $I_n = \int \cos^n x dx$ , then prove that  $I_n = \frac{1}{n} \sin x \cos^{n-1} x + \frac{n-1}{n} I_{n-2}$ . Hence evaluate  $\int_0^{\frac{\pi}{2}} \cos^6 x dx$  8

6. a) Find the area bounded by the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$ . 5

- b) Find the area of the surface generated by revolving the right hand loop of the lemniscate  $r^2 = \cos 2\theta$  about the  $y$ -axis. 5

- c) Find the length or perimeter of the circle  $x^2 + y^2 = a^2$ . 5

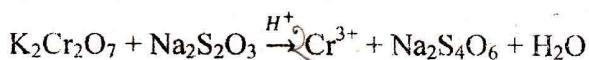
**Department of Computer Science and Engineering**  
**First Year First Semester B.Sc. Final Examination, 2013**  
**CHM – 1123: Chemistry**

**Total Marks: 60**

**Time: 2.5 Hour**

**[Answer any Four (4) of the following Questions]**

1. a) Define the following terms: 2×3  
 i) Mean free path //  
 ii) Critical pressure //  
 iii) Molar heat capacity //
- b) How and why real gases deviate from ideal behavior? 2
- c) Derive Vander Waal's equation for 'n' moles. 4
- d) What pressure is exerted by a mixture of 2.00 g of H<sub>2</sub> and 8 g of N<sub>2</sub> at 270 K in a 10 litre vessel? 3
2. a) Give a derivation of phase rule. 5  
 b) Find number of phases and components in – (i) composite of rubber and cellulose, (ii) mixture of sand, sugar and water, (iii) dissociation of limestone. 3
- c) Draw the phase diagram for ice ⇌ water ⇌ vapour system and explain the features of different curves, points and regions. 5
- d) Why the solidus in the above phase diagram is negatively sloped? 2
3. a) Derive an expression for the work done in an isothermal reversible expansion of an ideal gas and prove that the work done in such a process is the maximum. 4+2  
 b) State second law of thermodynamics. What is Carnot cycle? Derive the equation to calculate the efficiency of an engine using Carnot cycle. 1+1  
 c) The heat of combustion at constant pressure of benzoic acid is -771.4 K. Cal at 25 °C. What is heat of combustion at constant volume? 2
4. a) What is the difference of order and molecularity of a reaction? Explain. 3  
 b) How would you distinguish a first order reaction from a second order reaction with the help of half life? 5  
 c) In a certain first order reaction half of the material is decomposed in 1000 seconds. How long will it be until only one-third is left? 3  
 d) Chemical equilibrium is also known as "dynamic equilibrium", explain. 4
5. a) Define electrophiles and nucleophiles with examples. 3  
 b) Given a general scheme of Friedel-Craft alkylation with conditions. What are the disadvantages of this reaction? 4  
 c) Grignard reagent is classified as organometallic compound, explain it with its special reaction properties. 4  
 d) Electrophilic aromatic substitution is easier compared to nucleophilic aromatic substitution, explain. 4
6. a) Define oxidation-reduction with electronic concept. 3  
 b) Oxidation-reduction is a simultaneous process, explain. 4  
 c) Balance following equation with electronic concept of oxidation-reduction. 4



- d) Explain metallic bond and special properties of metal. 4

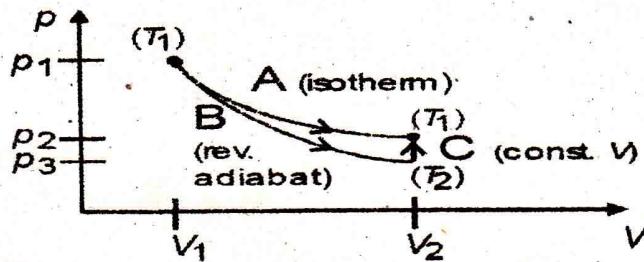
**University of Dhaka**  
**Department of Computer Science and Engineering**  
**First Year First Semester B. Sc. Final Examination, 2013**  
**PHY – 1122: Physics**

**Total Marks: 60**

**Time: 2.5 Hours**

**(Answer any Four (4) of the following Questions)**

1. a) Define intensive and extensive thermodynamic variables. 2
- b) Define entropy in terms of Boltzmann relation. State third law of thermodynamics. 2+2
- c) Show that for Ideal gas  $U = C_v dT$ . 4
- d) Calculate  $\oint \frac{dq}{T}$  for the path A–B–C and A–C. 5



2. a) Write down the postulates of Bohr model of atom. 4
- b) State Wilson-Sommerfeld quantization rule. Show that the condition for the orbital stability is  $L = n\hbar$  using this rule. 3+4
- c) What is De Broglie matter wave? What is the relation between this wave and the wave function  $\Psi$ ? 2+2

3. a) Write down the postulates of special theory of relativity. 2
- b) Derive the relativistic velocity addition formula using Lorentz transformation. 5
- c) Show that a moving clock ticks slower than a clock at rest. 4
- d) Suppose a train is moving with a uniform velocity  $\frac{3}{4}c$  with respect to an observer at S frame of reference. An observer in the moving train measures the speed of light at vacuum c. What will be the velocity of that light in free space for an observer at S. 4

4. a) Distinguish between Fraunhofer and Fresnel diffraction. 4
- b) Explain 'missing order' in Fraunhofer double slit diffraction pattern. 5
- c) Deduce radius of the  $n$ th order bright ring formed in Newton's ring experiment. 6

5. a) Write down the four Maxwell's equations of classical electrodynamics. 4
- b) Derive the continuity equation given by  $\frac{\partial \rho}{\partial t} + \nabla \cdot J = 0$ . 4
- c) Find out the expression for electric field  $E$  at distance  $r$  from a midpoint of a wire of length  $2L$  with charge density  $\lambda$ . 4
- d) Explain the inconsistency in Ampere's law. 3

6. Write Short notes on the following topics: 3×5
  - i. Simple harmonic motion
  - ii. Defects in solid
  - iii. Nicol Prism.

University of Dhaka  
Department of Computer Science and Engineering  
First Year First Semester B. Sc Final Examination, 2013  
CSE - 1102: Programming Fundamentals

Total Marks: 60

Time: 2.5 Hours

(Answer any Four (4) of the following Questions)

1. a) What do you understand by the term "data type"? Show the simple data types used in "C" language in a tree structure. 4
  - b) Suppose, you need to use four data for a circle: (i) name (alphanumeric – maximum of 10 characters), (ii) the radius, (iii) the circumference, and (iv) the area. Then,
    - A. What types of data would you use for these?
    - B. Write down the C programming variable definitions for these data.
  - c) Write a program in C language that will compute and print the value of pi ( $\pi$ ) from a circle as represented in question 1(b). In case of printing the value of  $\pi$ , print 6 digits after the decimal point. 5
- 
2. a) The two basic complex data structures in C are: (i) Array and (ii) Structure. What are their relative advantages and disadvantages? When would you choose arrays and when structures? Why? 6
  - b) Suppose, you need to operate on 30 student records where each student record consists of the followings:
    - i) Roll number, ii) name (of max length 30 characters), iii) date of birth, and iv) age. Write down the data definitions that you will use in programming.
  - c) For the data definitions used in question 2(b), write the **scanf** and **printf** statements to take input and show values, respectively. 3
- 
3. a) In C language, what is the difference between "NULL" and "void"? Explain with examples. 3
  - b) What would be the value of the variable **val** after execution of the following statement blocks? Briefly describe how the value is assigned. 3+5
    - i) 

```
float ifConfusing;
int val;
ifConfusing = 0.19839127;
val = ifConfusing <= 0.19836 ? ifConfusing :
(ifConfusing > 22/7 ? 22/7 - 1 : 22/7 - 2);
```
    - ii) 

```
unsigned char mayConfuse;
unsigned char val;
mayConfuse = 255;
if ( ++mayConfuse )
    val = mayConfuse & 2;
else
    val = (mayConfuse | 2 ) >> 1;
```
  - c) Suppose, you have a function that computes the Euclidian distance of a point (x, y, z) from the origin (0,0,0) and its prototype is:  

```
double eDistance(float *x, float *y, float *z);
```

Write the function body. 4

- mark
4. a) What is the differences between while and do-while loop? 3
- b) Write a program using conditional operators to determine whether a year entered through the keyboard is a leapyear or not. 4 \*
- c) Two numbers are entered through the keyboard. Write a program to find the value of one number raised to the power of another. 4
- d) Write a program to print all prime numbers from 1 to 300. 4
5. a) Write the syntax of if-else-if with example. 3
- b) Given three points  $(x_1, y_1)$ ,  $(x_2, y_2)$  and  $(x_3, y_3)$ , write a program to check if all the three points fall on one straight line. 5
- c) What is Swapping? How can you swap two numbers with and without temporary variable? Explain with proper example. 4
- d) What are the differences between  $i++$  and  $+i$ . 3
6. a) What are the modes for opening a file in C using fopen? 3
- b) Suppose, you have to store 100 points in  $id: (x, y)$  format in a file, where  $id$ ,  $x$  and  $y$  are three parameters of a point indicating the identification number,  $x$  location and  $y$  location of the point, respectively. Write a program that will generate the points and store in the file. 7
- c) Write a program that will open the file generated by the program in question 6(b) and show the content of the file in the screen. 5

**University of Dhaka**

**Department of Computer Science and Engineering**

**First Year First Semester B. Sc. Final Examination, 2013**

**CSE – 1101: Computer Fundamentals**

**Total Marks: 60**

**Time: 2.5 Hours**

**(Answer any Four (4) of the following Questions)**

1. a) Mention the features of the 4<sup>th</sup> generation computers. 2.5  
b) Mention the function of BIOS. 1.5  
c) Define microprocessor. What are the three basic tasks performed by a microprocessor? 4  
d) What are the advantages of RISC architecture over CISC architecture? 3  
e) How can we measure the speed of a microprocessor? 1.5  
f) With example define opcode and operand of an instruction. 2.5
2. a) Distinguish between primary memory and secondary memory. 2  
b) Write down the differences between SRAM and DRAM. 3.5  
c) DVD stores more data than CD. Why? 2  
d) Describe the structure and working principle of hard disk and hard disk drive. 6  
e) What are the advantages of flash memory stick? 1.5
3. a) Explain working principle of an optical mouse. 3  
b) Describe working principle of ink-jet printers. 4  
c) Mention types of scanner. 1  
d) Explain working principle of a speaker. 3  
e) Mention the advantages of LCD monitor. 3  
f) What is meant by dot pitch of a color monitor? 1
4. a) Distinguish between assembly language and high level language. 2  
b) What is the role of an operating system in a computer system? 3.5  
c) Write down the features of Linux. 2  
d) What is the main difference between compiler and interpreter? 1.5  
e) Define ASCII code and Unicode. Mention the advantages of Unicode over ASCII code. 3  
f) Define database management system. Mention the operations performed by a DBMS. 3
5. a) What is meant by telecommunication? 1  
b) Distinguish between ring and star topology. 3.5  
c) Mention the functions of a router. 2  
d) Describe the structure and advantages of optical fiber. 3  
e) Define network protocol. Explain HTTP and FTP. 3.5  
f) Mention frequency ranges for wireless transmission. 2
6. a) Define Internet. Discuss about the impact of the Internet. 6  
b) Mention the value of the Internet penetration rate in Bangladesh. 1  
c) It is said that open source software is more secured. Is it correct? Explain. 3  
d) How can we maintain network security? 3  
e) Distinguish between virus and Trojan horse. 2

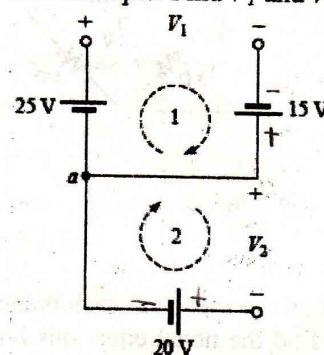
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**EEE – 1121: Electrical Circuit Analysis**

**Total Marks: 60**

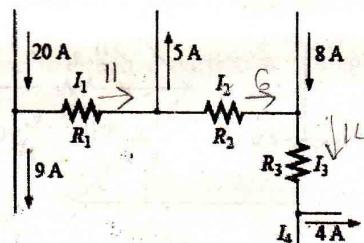
**Time: 2.5 Hour**

**[Answer any Four (4) of the following Questions]**

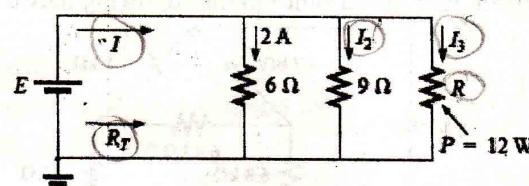
1. a) Define resistance of a material. Briefly describe the temperature effects on the resistance of conductor, semiconductor and insulator. 2+3
  - b) Plot curves of Ohm's law for  $5\ \Omega$  and  $10\ \Omega$  resistors in a range of 0 to 30 V. Relate the curves with equations of a straight line and find the slope in both the cases. 3+2
  - c) Define efficiency of a system. A 2-hp motor operates at an efficiency of 75%. What is the power input in watts? If the applied voltage is 220 V, what is the input current? 2+3
- 
2. a) State Kirchhoff's voltage law with example. Find  $V_1$  and  $V_2$  for the following network. 2+2



- b) State Kirchhoff's current with example. Find the unknown currents and their directions in the following circuit. 2+2

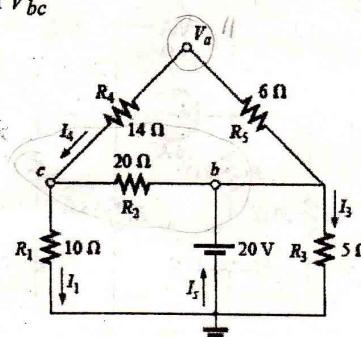


- c) Find the unknown quantities for the following circuit using the provided information. 4

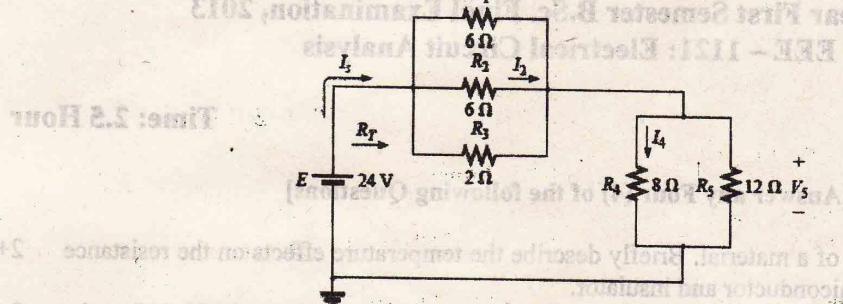


- d) What is the main characteristics regarding voltage and current of an open circuit and a short circuit? Explain with example. 3

3. a) For the following network:
  - i) Determine the currents  $I_S$ ,  $I_1$ ,  $I_2$ ,  $I_3$ ,  $I_4$
  - ii) Calculate  $V_a$  and  $V_{bc}$

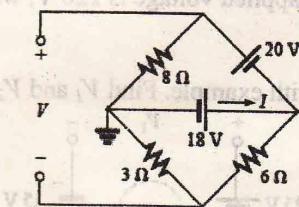


- b) Find the indicated currents and voltages for the following network.



- c) For the network of following figure:

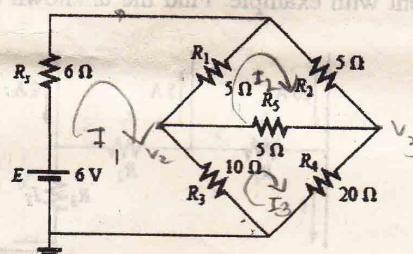
- Determine the current  $I$
- Calculate the open-circuit voltage  $V$



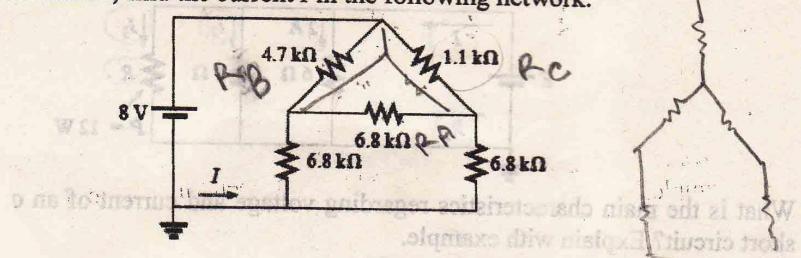
4. a) What is linear bilateral network? What are the differences between voltage source and current source? 1+2

- b) Consider the bridge network below:

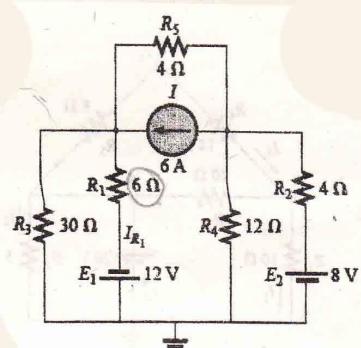
- Using mesh analysis, find the current in each branch.
- Using nodal analysis, find the nodal equations for the network and also find the current in each branch.



- c) Using a  $\Delta$ -Y conversion, find the current  $I$  in the following network. 4



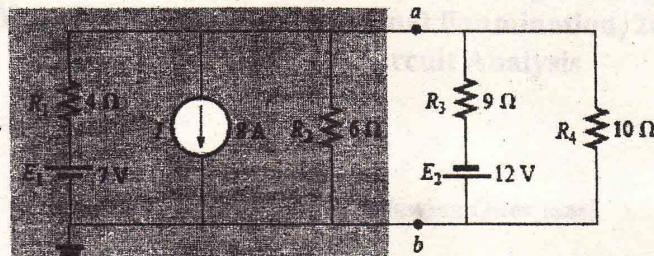
5. a) Using superposition theorem, find the current through  $R_1$  for the following network. 4



3

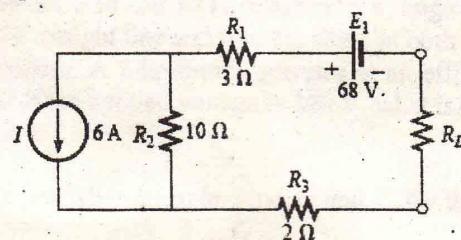
- b) Find the Norton equivalent circuit for the portion of the network to the left of a-b in the following figure.

4



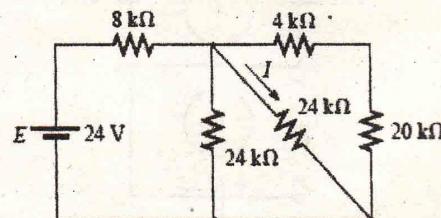
- c) Find the value of  $R_L$  in the following figure for maximum power transfer to  $R_L$ , and determine the maximum power.

4



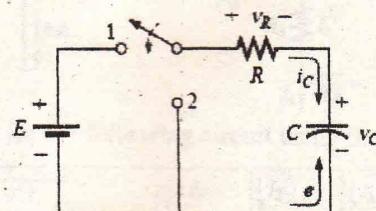
- d) For the following network, determine the current  $I$ . Explain whether the reciprocity theorem is satisfied or not.

3



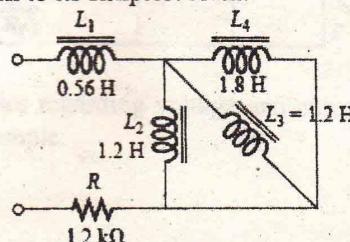
6. a) Define permittivity of the dielectric. Using this definition derive the equation of capacitance. 2+2  
 b) Derive the equation for time to reach a particular voltage or current during charging phase in a basic capacitive network.

4



- c) Reduce the following network to its simplest form.

3



- d) Find the voltage  $V_1$  and the current through each inductor in the following circuit.

4

