Department of Computer Science and Engineering
University of Dhaka
In-Course Examination
CSE 1101 Fundamentals of Computers and Computing
Marks: 20 Time: 1 hour 15 min

command

1. a. Differentiate between imperative and declarative programming language. [2]

b. Perform the any base to any base conversion for the given input $(6452)_7 = (?)_6$ [1]

c. Perform correction in the given C code- [2]

```
#include<studio.h>
int Main()
{
int x=36;
if( x % 2 = 0 )
{
   if( x % 3 = 0 )
{
      x = x + 1;
      printf("x value = %f\n",x);
      }
      }
      printf("statement after if\n"); }
      return 0;
}
```

d. Define four measurements used to evaluate a disk system's performance. An example of measurement used to evaluate a disk system's performance is seek time. [2]

2. a. What is an advantage of representing images via geometric structures as opposed to bit maps? What about bit map techniques as opposed to geometric structures? [2]

b. [2]

Decimal Number	Excess notation system using bit patterns of length three	Excess eight
3		
-2		

c. In terms of the floating-point format representation using mantissa and exponent, which of the patterns 01001001 and 00111101 represents the larger value? [2]

3. a. If a text contains "[illegible]" symols, represent the text in Huffman code. For the Huffman representation of the code perform the step by step simulation like frequency counting, generating Huffman tree and others. [2]

b. If opcode 1 represents Loading, 5 represents Addition, 3 represents Storing and C represents Halt, then translate the given encoded instructions sequence. [2]

156C → memory cell
166D → ''
5056
306E → ''
C000.

c. What is the difference between time-sharing and multitasking? [1.5]

d. What are the conditions of deadlock occurrence? [1.5]

excess

a=11
b=01
c=100
d=000
e=101
f=001

Incourse Examination

CSE1102: Discrete Mathematics

Duration: 1 hr 20 minutes

Full Marks: 40

1. A certain country is inhabited only by people who either always tell the truth or always tell lies, and who will respond to questions with only a "yes" or a "no". A tourist comes to a fork in the road, where one branch leads to the capital and other does not. There is no sign indicating which branch to take, but there is an inhabitant, Mr. Z, standing at the fork. What single yes/no question should the tourist ask him to determine which branch to take? 5

2. i) Express the statement "Everyone has exactly one best friend" as a logical expression involving predicates, quantifiers with a domain consisting of all people, and logical connectives. 2

   ii) Translate each of these statements into logical expressions in three different ways by varying the domain and by using predicates with one and with two variables. 3

   a) Someone in your school has visited Uzbekistan.
   b) Everyone in your class has studied calculus and C++

3. 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." 3

4. Prove that an integer is even if and only if its square is even 3

5. i) Give an example of a relation on a set that is 3

   a) both symmetric and antisymmetric. $\{(1,1)\ (2,2)\ (3,3)\}$
   b) neither symmetric nor antisymmetric

   ii) Determine whether the relation R on the set of all people is reflexive, symmetric, antisymmetric, and/or transitive, where (x, y) ∈ R if and only if 4

   a) x is taller than y.
   b) x and y were born on the same day.
   c) x has the same first name as y.
   d) x and y have a common grandparent.

6. i) Consider these functions from the set of students in a discrete mathematics class. Under what conditions is the function one-to-one if it assigns to a student his or her 2

   a) mobile phone number
   b) student identification number
   c) final grade in the class
   d) home town

   ii) Give an example of a function from **N** to **N** that is 5

   a) one-to-one but not onto.
   b) onto but not one-to-one.
   c) both onto and one-to-one (but different from the identity function).
   d) neither one-to-one nor onto

7. Use mathematical induction, prove the following. 10

   a) Prove that $2^n > n^2$ if n is an integer greater than 4.
   b) Prove that 3 divides $n^3 + 2n$ whenever n is a positive integer.

$2^{k+1} > (k+1)^2$

$2^k.2 > k^2+2k+1$

$2^k > k^2$

$(2^k+1) > (k^2+1)$

$2.2^k+2 > k^2+1.$

$2.2^k > k^2+1.$

$\cancel{2 > 2T}$

$K = 4$

0

B B R O Y G B V G W
0 1 2 3 4 5 6 7 8 9

University of Dhaka

Department of Computer Science and Engineering

1st year Incourse Examination, 2019

CSE - 1103: Electrical Circuits

Full Marks: 30 — Duration: 1 hour 30 minutes

Answer any five from the following questions. — $5 \times 6 = 30$

1. a) Define superconductor. A 22Ω wire-wound resistor is rated at +200 PPM for a temperature range of -10°C to +75°C. Determine its resistance at 65°C. **3**

   b) Find the range in which a resistor having the following color band must exist. **3**
   1st band: Green, 2nd band: Blue, 3rd Band: Yellow and 4th band: Gold.

2. a) A motor is rated to deliver 2 hp. **3**
   - i. If it runs on 110 V and is 90% efficient, how many watts does it draw from the power line?
   - ii. What is the input current?
   - iii. What is the input current if the motor is only 70% efficient?

   b) Show that, the current through any branch of a parallel resistive network is equal to the total resistance of the parallel network divided by the resistor of interest and multiplied by the total current entering the parallel configuration. **3**

3. a) What happens when two voltage sources are placed in parallel? Assuming identical supplies, determine the current ***I*** and resistance ***R*** for the parallel network in fig 3.1. **3**

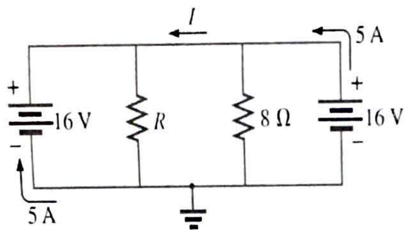


Fig. 3.1

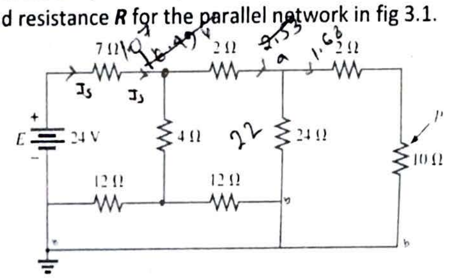


Fig. 3.2

   b) Determine the power delivered to the 10Ω load in Fig. 3.2. **3**

4. a) For the network in Fig. 4.1, **3**
   - i. Determine R_T.
   - ii. Calculate V_a
   - iii. Determine ***I*** (with direction).

   b) For the network in Fig. 4.2, **3**
   - i. Find voltages V_{ac} and V_{bc}.
   - ii. Find current I_2.
   - iii. Find the source current I_{s3}.

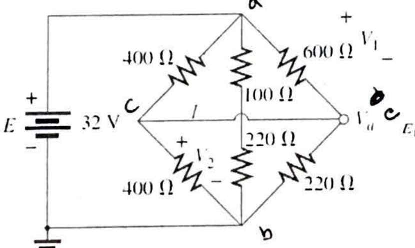


Fig. 4.1

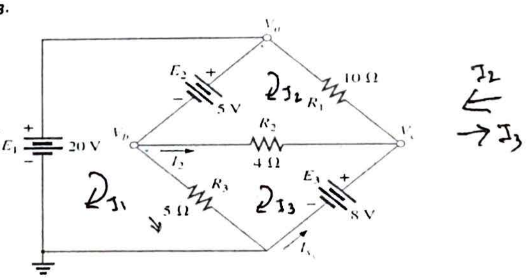


Fig. 4.2

5. Find the current through 5Ω resistor using mesh analysis and the voltage V_a using nodal analysis in the circuit shown in fig 5.1. **3+3**

6. Derive equations to convert the **Y**-configuration to **Δ**-configuration and vice versa as shown in fig 6.1. **3+3**

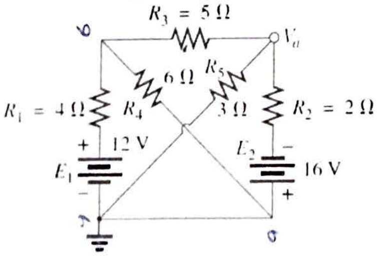


Fig. 5.1

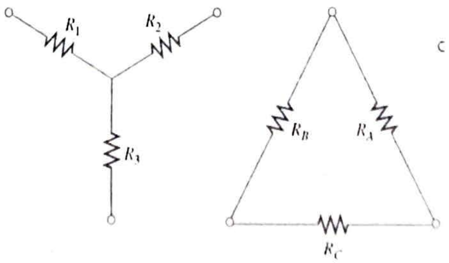


Fig. 6.1

In-course Examination

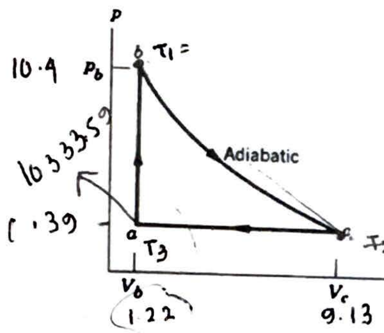
Physics, CSE-1104

March 27,2019

Answer ALL questions

Time: 1 hour 30 minutes [Marks 25]

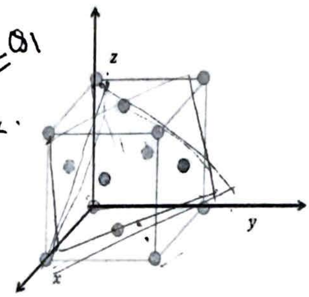
1. Two moles of a monatomic ideal gas are caused to go through the cycle shown in the left figure below. Process bc is a reversible adiabatic expansion. Also $p_b = 10.4$ atm, $V_b = 1.22$ m^3 and $V_c = 9.13$ m^3. Calculate: (a) the heat added to the gas, (b) the heat leaving the gas, (c) the net work done by the gas, (d) the change of entropy in processes ca and ab, and (e) the efficiency of the cycle. [1+1+1+(1+1)+1=6]



$\frac{T_1}{T_2} = \frac{Q_1}{Q_2}$ Q1

77316.06K.

~~T_2 = 77316.0~~



2. **Maxwell-Boltzmann Distribution:** The Maxwell-Boltzmann speed distribution formula is given by:

$$N_v(v) = 4\pi N\left(\frac{m}{2\pi k_B T}\right)^{3/2} v^2 e^{-mv^2/2k_BT}$$

   (a) Draw the above distribution with respect to speed of the molecules for different temperatures. Identify the most probable speed, average speed and the RMS speed in the figure. [1+1]

   (b) From the speed distribution formula, derive the energy distribution formula assuming only kinetic energy as the internal energy of an ideal gas. · ½KT [1]

   (c) Hence derive the mean energy, the most probable energy and the RMS energy of an ideal gas in thermal equilibrium at temperature T. [1+1+1]
   You may find the following integrals useful: $\int_0^\infty u^{3/2}e^{-u}du = (3/4)\sqrt{\pi}$, $\int_0^\infty u^{5/2}e^{-u}du = (15/8)\sqrt{\pi}$

   (d) Is the most probable energy equal to $(1/2)mv_{mp}^2$, where m is the mass of a gas molecule and v_{mp} is the most probable speed? Explain. [1]

3. **FCC Lattice:** Consider a cubic lattice with the edges of the conventional unit cell along the $x-$, $y-$ and $z-$axis and the length of an edge equal to a.

   (a) Draw the (100), (101) and (111) planes of the lattice within the unit cell. [0.5+0.5+0.5]

   (b) Draw all the members of the family of planes belonging to {100}. How many planes will be in this family? Write the Miller indices of all of them. [1.5]

   (c) How many members are in the families of planes {110} and {111}? [0.5+0.5]

   (d) How many members are in the family of directions < 100 >, < 110 > and < 111 >? Write the indices of all the members. [0.5+0.5+0.5]

   (e) The planar density of atoms is defined as the number of atoms per unit area in a particular plane. Considering the FCC lattice, find the planar density of atoms in the (100), (110) and (111) planes. [0.5+0.5+0.5]

   (f) Considering the FCC lattice, calculate the packing fraction, if the atoms at the lattice points are considered as identical spheres. [2]

   (g) Find the reciprocal lattice vectors of the FCC lattice. [2]

   (h) Identify in a clear figure the nearest neighbours of a particular atom in the FCC lattice. Find the distance to the nearest neighbours and the next-to-nearest neighbours. [0.5+(0.25+0.25)]

12

1.596 1.4 1.7

avg $= \sqrt{\frac{8KT}{\pi m}}$ $\sqrt{3}$ KT. $V_p = \sqrt{2}$

A

$V_{rms} = \sqrt{3KT}$

BBN

University of Dhaka
Department of Computer Science and Engineering
MID Term Exam-2019
Course Title: Differential and Integral Calculus
Course Number: MATH-1105; Marks: 40

Time: 1 Hour

Answer any 4 questions.

1. (a) Sketch the graph of the following functions and find its domain and range.

(i) $f(x) = 1 - 2^x$, **(iii)** $f(x) = \sqrt{-x}$, **(iv)** $f(x) = \dfrac{3}{x-2} + 1$

(b) Define limit of a function. Evaluate the followings: (i) $\lim\limits_{x \to \infty} \dfrac{3x+5}{6x-8}$ **(ii)** $\lim\limits_{x \to \infty} \dfrac{5x^3 - 2x^2 + 1}{1 - 3x}$

2. Test the continuity and differentiability of a function $f(x)$ at a point $x = \pi/2$, where

$$f(x) = \begin{cases} 1, & x < 0 \\ 1 + \sin x, & 0 \le x < \pi/2 \\ 2 + (x - \pi/2)^2, & x \ge \pi/2. \end{cases}$$

3. Suppose that $g(x) = 3x^2 - 2x + 3$

(a) Find the average rate of change of g from 0 to 1.

(b) Find an equation of the secant line containing $(-2, g(-2))$ and $(1, g(1))$

4. (a) Find the differential coefficient $\dfrac{dy}{dx}$ of the function $x = \sin^{-1}\dfrac{2t}{1+t^2}$, $y = \tan^{-1}\dfrac{2t}{1-t^2}$.

(b) Use implicit differentiation to find $\dfrac{dy}{dx}$ if $5y^2 + \sin y = x^2$.

(c) Use logarithmic differentiation to find $\dfrac{dy}{dx}$ of $y = (x^2 + 1)^{\sin x}$

5. (a) 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?

(b) A baseball diamond is a square whose sides are 90 ft long. Suppose that a player running from second base to third base has a speed of 30 ft/s at the instant when he is 20 ft from third base. At what rate is the player's distance from home plate changing at that instant?

6. (a) Let $f(x) = x^4 - 2x^2$. Find the intervals on which the function $f(x)$ is increasing, decreasing, concave up and concave down. Also, find the local extrema of $f(x)$.

(b) State L'Hospital rule. Apply this rule to evaluate $\lim\limits_{x \to 0} \dfrac{e^x + \ln\left(\dfrac{1-x}{e}\right)}{\tan x - x}$.

4-3

$\dfrac{1}{\sqrt{1-x^2}}$ $\dfrac{1}{1+x^2}$ $\dfrac{1}{x\sqrt{x^2-1}}$