KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 2nd Year 1st Term Examination, 2021
Department of Computer Science and Engineering
CSE 2101
Object Oriented Programming

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Discuss data hiding with necessary figure. Show memory allocation of objects. (10)
   b) "The speed benefits of inline function diminish as the function grows in size." – Justify the statement. (07)
   c) What are the special characteristics of static member variable? How can you access static functions of a class without creating any object? Explain with example code. (10)
   d) When passing objects as function arguments, what is the main advantage of "pass-by-reference"? Explain with proper example. (08)

2. a) Why should the copy constructor accept its parameter by reference in *C++*? (08)
   b) "*this*" pointer helps to use cascade function call. Explain with proper example. (10)
   c) Consider, you have a class named "*Test*". The class contains one default constructor which prints the character "*c*" when called and one destructor which prints the character "*o*" when called. Now, for the given main function, show and explain the output (also write the complete code on paper). (10)

```
int main () {
      Test t = Test();
      Test();
      t.~Test();
}
```

   d) What is dynamic constructor? Write the special characteristics of destructor. (07)

3. a) Is it possible to overload ">>" operator using member function? Explain. Overload the "<<" operator using friend function. (12)
   b) How does *C++* compiler differentiate between overloaded postfix and prefix decrement operators? Explain with appropriate examples. (10)
   c) Write a program to multiply two complex number. Also overload the "++" operator. Sample input and output are given below: (13)

input		Object
real	img	
3	5	$3+5i$
4	6	$4+6i$

Main body:
`Complex c1(3,5), c2(4,6);`
`Complex c3 = c1 * c2;`
`Complex c4 = ++c3;`
`Complex c5 = c4++;`

Add display function to showcase the value of objects at the end of main function.

4. a) What is STL? Discuss about the types of STL containers. Give an example, how does stack work? (10)
   b) How can you initialize a class using initialization list? When all the member variables are public? (10)
   c) Consider the sample input and output files. (10)

input.txt	
computer	50000
mobile	20000
RAM	5000

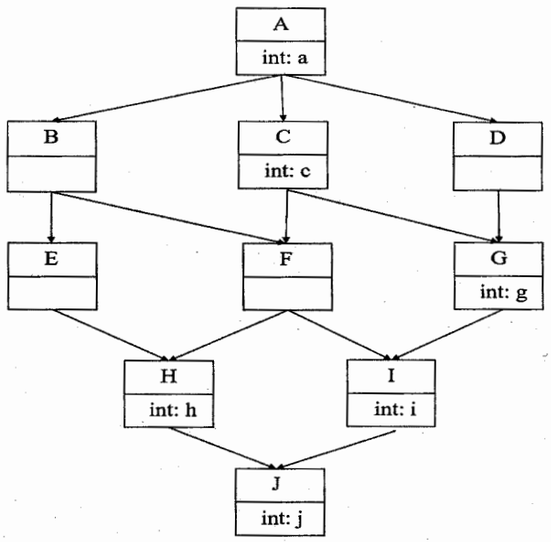
output.txt
Total: 75000

Write a program to read from *input.txt* file and add the prices of each item and save the total in *output.txt* file.
   d) Give an example of overloading *const* and *non-const* function. (05)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) What do you mean by data encapsulation? How does it can be implemented in OOP? (09)
   b) Explain "Has-A-Relation" with proper example. (06)
   c) Consider the following diagram for extending class. The arrows indicate the base class to derived class. The capital case letters indicate the class name and others are public data members. Now, implement the diagram into a C++ code. What is the problem occurred in the main function program? How do you solve this using least number of "virtual" keywords? Don't use extra "virtual" keyword. (20)




```
#include <iostream>
using namespace std;
int main ()
{
    J x; I y;
    x.a = 9; y.c = 0;
    return 0;
}
```

6. a) Discuss the problem in single inheritance. How can you overcome this problem? (13)
   b) How to make a private member inheritable? Explain with example. (07)
   c) A class is named *Rectangle* having two attributes *length* and *width*, and a member function *area (length, width)* to generate the area of a rectangle. Another class named *Triangle* use to extend the *Rectangle* class and having another attribute *height*. Use constructor in both classes to initialize an object of the classes. Then, declare and initialize objects of both classes and calculate the area. You must use *Rectangle* class pointer of object for the calculations. (15)

7. a) Why operator and function overloading are called compile time polymorphism? (10)
   b) What will be the output of the following code? And why? If any error occurs, then answer why and how can you solve it? (15)

```
#include <iostream>
using namespace
std;
class Base {
public: int b;
void display(){
cout<<"Base\n";}
};
```

```
class Derived:
public Base {
public: int d;
 void display(){
 cout<<"Derived\n";
  }
};
```

```
int main () {
  Base *bp, b;
  Derived *dp, d;
  bp = &d;
  bp→b=2; bp→d=3;
  bp→display();
  return 0;
}
```

   c) When do we make a virtual function pure? What are the implications of making a function a pure virtual function? (10)

8. a) How does error differ from exception? State how rethrowing of exception work? Give an example. (13)
   b) Briefly describe the different membership function of *type_info* class of RTTI. (11)
   c) Analyze the output of the program. (11)

```
#include <iostream>
using namespace std;
int f(int x)throw(){
    if (x == 1) throw 1;
    else throw 0;
    return 0;
}
```

```
int main(){
    try{
        f(1);
    }
    catch(int){
        cout << "Exception type
Integer is detected\n";}
    return 0;
}
```

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 2nd Year 1st Term Examination, 2021
Department of Computer Science and Engineering
CSE 2105
Data Structures and Algorithms

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) What do you mean by data structure? What are the basic operations of data structure? (08)
   b) Suppose A is a three dimensional array declared in C language. The location of A[0][0][0] is ∝ and the declaration is A[5][6][7]. (11)
      i) Where is the location of A[1][2][3] if the row-major representation is used?
      ii) Where is the location of A[4][5][6] if the column-major representation is used?
   c) Given two sorted arrays A with *n* elements and B with *m* elements. Write a method merging the elements of B into A in sorted order without using extra space. Assume A has a large enough buffer at the end to hold all of B's elements. (09)
   d) Write an algorithm modifying the binary search algorithm, to insert an item into a sorted linear array. (07)

2. a) Define stack. "Stacks are used where processing of data must be postponed until other conditions are full-filled " – draw your opinion about the statement. (10)
   b) Translate, showing stack contents at each step, the following arithmetic infix expression to its equivalent postfix one. (09)

      Exp: a/b*(c+(d – e))

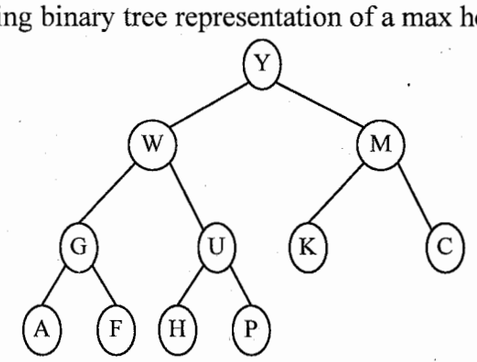
   c) Why do the circular array implementation of a queue is better than array implementation? Explain with example. (06)
   d) Consider the following deque of characters where DEQUE is a circular array which allocates six memory cells: (10)

      LEFT = 2, RIGHT = 4, DEQUE: ------, A, C, D, ------, ------.

      Describe the deque while the following operations take place:
      i) F is added to the right of the deque.
      ii) Two letters on the right are deleted.
      iii) K, L, M are added to the left of the deque.
      iv) One letter on the left is deleted.
      v) R is added to the left of the deque.

3. a) How can you minimize overflow in stack? Explain with example(s). (06)
   b) What are the moves allowed by the solution of Towers of Hanoi problem when $n = 4$ disks. (11)
   c) Show the steps if you apply quicksort algorithm for the following data in ascending order: 66, 33, 40, 22, 53, 88, 60, 11, 80 and 20. (11)
   d) What is Sparse and Dense matrix? How to represent the Sparse matrix by linked list? (07)

4. a) Consider the following binary tree representation of a max heap. (13)

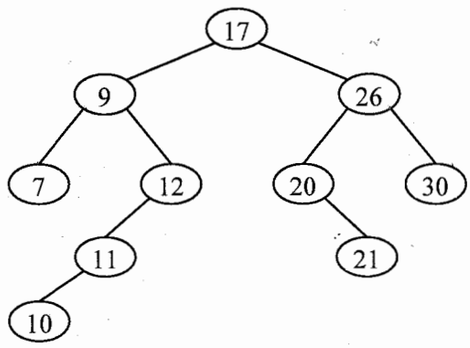


   i) Give the array representation of the heap.
   ii) Delete the maximum key. Give the resulting heap, circling any entries from (i) that changed.
   iii) Insert the key Q into the original binary heap, circling any entries from (i) that changed.

b) What do you mean by heap and heap property? (05)

c) Define priority queue. How do you write priority queue in a linear array and one-way list. (07)

d) Consider the following binary search tree T. Show stepwise, the in-order traversal result of T after the key 17 is deleted. (10)



SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Write an efficient searching algorithm for sorted linked list. (08)

b) Given a singly linked list, write a program to split it into two sub-lists one for the front half, and one for the back half. If the number of elements is odd, the extra element should go in the front list. (11)

Example:
Input: 2→3→5→7→11
Output: list 1: 2→3→5 list 2: 7→11

You should check your solution against a few cases (length of the list = 2, 3, 4) to make sure that the list gets split correctly near the short-list boundary conditions.

c) Write a simple program using two-way linked list to swap *k*th node from beginning with *k*th node from end. (11)

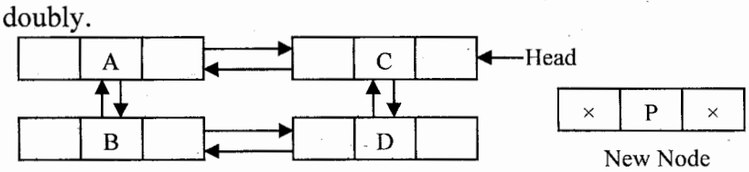
Example:
Input: 1←→2←→3←→4←→5, $k = 2$
Output: 1←→4←→3←→2←→5.

d) Briefly explain the garbage collection procedure in linked list. (05)

6. a) Given two singly linked list, write a simple program to merge their nodes together to make a new list, by taking node alternately between the two lists. (10)

Input: list 1: 1→2→3, list 2: 7→13→5
Output: 1→7→2→13→3→3→5.

b) The following figure is a circular-doubly linked list. Provide necessary code to add the new node P to the list. It has to cover all the cases so that if you add P at any places in the list will be circular and doubly. (12)

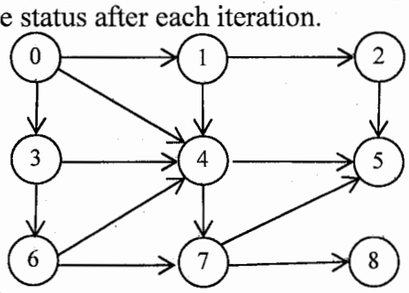


c) Sort the elements of the following array using top-down merge sort approach. Show all operations (low-mid-high indexes and merge operation). Write a simple program for it. (13)

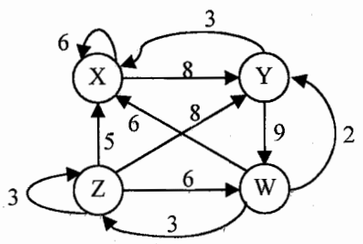
Cat	Bit	Hat	Mat	Rat	Bat	Hot	Bot	Sit

Also, calculate the complexity of this procedure.

7. a) Define the terms: Degree of a node, connected graph and multigraph. Now, run a Breadth First Search (BFS) algorithm on the graph *G* shown in following figure to find the minimum path *P* from 0 to 8. Show the queue status after each iteration. (15)



b) Consider the following weighted graph G. (10)

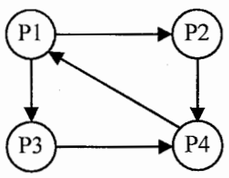


Calculate the shortest path cost matrix Q from the graph G using Shortest Path algorithm.

c) Consider the items: 77, 33, 44, 11, 88, 22, 66, and 55. Now you have to choose a sorting algorithm between Insertion sort and Selection sort algorithm to sort the numbers. In case of choosing the algorithm, you must consider the time complexity for all cases. Now, explain your answer why you choose the certain algorithm and show the sorting steps graphically. (10)

8. a) Consider a hash table of size 10 with has function $h(k) = k$ mode 10. Draw the table that results after inserting the values 20, 27, 25, 14, 49, 18, 65, 37 in the given order, for each of the scenarios below: (12)
   i) When collision is handled by separate chaining.
   ii) When collision is handled by quadratic probing.
   iii) When collision is handled by double hashing using a second hash function $h'(k) = 7 - (k \bmod 7)$.

b) Consider the following graph G. (15)



Now,
   i) Find the adjacency matrix A of G.
   ii) Find the path matrix P of G using power of adjacency matrix A.
   iii) Find the path matrix P using warshall's algorithm.
   iv) Is G strongly connected?

c) Write the partition function of Quicksort algorithm. What is the purpose of this partition function in Quicksort. (08)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 2nd Year 1st Term Examination, 2021
Department of Computer Science and Engineering
MATH 2107
Fourier Analysis and Linear Algebra

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define integral transform and hence find the kernel of the transform. Also find the kernel of Fourier sine transform. (10)
   b) Find the signal *x(n)* by using convolution for $X(z) = \frac{1}{\left(1-\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{4}z^{-1}\right)}$. (11)
   c) Find the inverse *z* transform of $X(z) = \frac{z}{(z-1)(z-2)(z-3)}$ Using partial fraction method for ROC $2 < |z| < 3$. (14)

2. a) Define causal and non-causal system with example. Test whether the following system are causal or not (i) $y(n) = x(n) - x(n-1)$, $(ii)\ y(t) = x(t^2)$. (15)
   b) Determine the *z* transform of the signal $x(n) = a^n cos wn.u(n)$. (10)
   c) By applying time shifting property, determine the ~~z transform of the~~ signal $x(z) = \frac{z^{-1}}{1-3z^{-1}}$. (10)

3. a) Write down the assumption for the validity of Fourier series expansion of a function. Find a series of sine and cosine multiple of *x* which represent $x + x^2$ in the interval $-\pi < x < \pi$ and hence deduce that, $\frac{\pi^2}{6} = \sum_{n=1}^{\infty}\left(\frac{1}{n^2}\right)$. (19)
   b) Define Parseval's identity. Use this identity to the function $f(x) = sinx,\ 0 < x < \pi$ and show that $\frac{1}{1^2.3^2} + \frac{1}{3^2.5^2} + \frac{1}{5^2.7^2} + \cdots \ldots = \frac{\pi^2-8}{16}$. (16)

4. a) Define odd and even function. If $f(t) = t^2, 0 \le t \le 1$ find its half range Fourier sine series. (11)
   b) Find the Fourier integral of the function $f(x) = e^{-kx}$ when $x>0$ and $f(x) = -f(x)$ for $k > 0$ hence prove that, $\int_0^{\infty} \frac{usinux}{u^2+k^2} du = \frac{\pi}{2}e^{-kx},\ k > 0$. (12)
   c) Find the Fourier cosine transform of $f(x) = \frac{1}{1+x^2}$ and hence derive Fourier sine transform of $\varphi(x) = \frac{x}{1+x^2}$. (12)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Define with example: (i) Hermitian matrix, (ii) Skew-Symmetric matrix, (iii) Nilpotent matrix, (iv) lower triangular matrix. (12)
   b) Define rank of a matrix. Find the rank of the matrix *A* by reducing it to normal form where, (13)

$$A = \begin{bmatrix} 1 & -1 & 1 & 1 & 1 \\ 1 & -1 & 2 & 3 & 1 \\ 2 & -2 & 1 & 0 & 2 \\ 1 & 1 & -1 & -3 & 0 \end{bmatrix}.$$

   c) Find the inverse of the matrix *A* by applying elementary transformation where, (10)

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}.$$

6. a) Let X_z and X_w be the co-ordinates of a ~~matrix~~ with respect to given pair of basis. Determine the matrix *P* such that, $X_w = PX_z$. Where $z_1 = [1,0,0]'$, $z_2 = [1,0,1]'$, $z_3 = [1,1,1]'$ *and* $w_1 = [0,1,0]'$, $w_2 = [1,1,3]'$, $w_3 = [1,-1,1]'$. (13)

b) For what value of λ the system of linear equation (13)

$$\begin{aligned} 3x - y + 4z &= 3 \\ x + 2y - 3z &= -2 \\ 6x + 5y - \lambda z &= -3 \end{aligned}$$

Possesses (i) a unique solution, (ii) infinitely many solutions. Determine the solution of the system for case (ii).

c) Compute AB by using partitioning where, (09)

$$A = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 4 & 1 & 3 & 2 \\ 2 & 1 & 3 & 0 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 1 & 4 \\ 4 & 1 & 2 \\ 2 & 1 & 2 \end{bmatrix}.$$

7. a) Define vector space. Show that (12)
$T = \{(a, b, c, d) \epsilon \mathbb{R}^4 : 2a - 3b + 5c - d^2\}$ is a subspace of $\mathbb{R}^4$.

b) Check whether the set of vectors $S = \{(2, -3, 1), (4, 1, 1), (0, -7, 1)\}$ from a basis for $\mathbb{R}^3$. (10)

c) Find the bases for the row space and column space of the matrix A Where, (13)

$$A = \begin{bmatrix} 1 & -2 & 5 & 0 & 3 \\ -2 & 5 & -7 & 0 & -6 \\ -1 & 3 & -2 & 1 & -3 \\ -3 & 8 & -9 & 1 & -9 \end{bmatrix}.$$

8. a) Find all the eigenvalues and a basis for the eigenspace for the smallest eigenvalue of the following matrix. (15)

$$A = \begin{bmatrix} 4 & -1 & 6 \\ 2 & 1 & -6 \\ 2 & -1 & 8 \end{bmatrix}.$$

b) Define inner product space. Let $\mathbb{R}^4$ have an Euclidian inner product. Use Gram-schmidt process to transform the basis vectors $\{u_1 \quad u_2 \quad u_3\}$ into an orthonormal basis where, (12)
$u_1 = (1, 1, 1, 1)$, $u_2 = (1, 2, 4, 5)$, $u_3 = (1, 3, -4, -2)$.

c) Define norm. Find the angle between the vectors $\underline{u} = (-1, -1, 2, 2)$ and (08)
$\underline{v} = (3, 2, 5, 4)$

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 2nd Year 1st Term Examination, 2021
Department of Computer Science and Engineering
CSE 2113
Computer Architecture

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Explain the terms: (i) Computer Architecture and (ii) Computer organization with suitable examples. (08)
   b) Draw the block diagram of a general-purpose computer and explain it in the light of Von-Neumann architecture. (11)
   c) Explain the operation of IAS machine with proper diagram. (09)
   d) Explain the speed up factor of a computes system. (07)

2. a) State and explain Moor's law with figure. (07)
   b) Define overflow. Design an overflow detector circuit by discussing underlying theory. (10)
   c) Describe Booth's algorithm for two's complement multiplication. (08)
   d) What are the principles concerns for computer arithmetic? "2's complement representation is better than 1's complement and sign magnitude representation" – Justify. (10)

3. a) What is meant by branch penalty? Discuss the various approaches for dialing with branches. (10)
   b) Explain data flow in fetch, indirect and interrupt cycle. (06)
   c) What is register? Explain user visible register and status registers with example. (07)
   d) Compute Z = (A/B)*(C/D+E*F) using zero, one, two, three address instruction. (12)

4. a) Define addressing modes. Discuss different type of addressing modes with their principal advantages and disadvantages. (12)
   b) Differentiate between CISC and RISC. (06)
   c) Compare the superscalar and super pipelined approaches using example. (08)
   d) Explain the limitation of instruction level parallelism. (09)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) What is memory cycle time? Explain merits and demerits of separate data and address buses. (10)
   b) Explain memory cell operations with figures. (10)
   c) In a computer system, main memory and cache memory ratio is 64:8 and 16 bits are for addressing, Find: (15)
      i) TAG, BLOCK and WORD bits in direct mapping when block size is 8 words.
      ii) TAG and WORD for associative mapping when block size is 16 words.
      iii) TAG, SET and WORD bits for set-associative mapping for 4 blocks per set and 16 words per block.

6. a) Consider a disk with an advertised average seek time for 5 ms, rotation speed 1500 rpm and 512 byte sectors with 400 sectors per track. We wish to read a file consisting of 5 tracks. Find total average access time for:(i) sequential access and (ii) random access. (10)
   b) Explain the terms: (i) Write back protocol, (ii) Write through protocol, (iii) Hit rate, (iv) Miss penalty, and (v) Dirty bit. (10)
   c) How does RAID 3 reconstruct data in the event of drive failure? (08)
   d) What is micro-operation? How can we use the concept of micro programming to implement a control unit? (07)

7. a) Consider three interrupt handles X, Y and Z (having priorities X>Y>Z) with interrupt service routine (ISR) 10, 20, 30 respectively. Graphically show the transfer of control for interrupt sequence of Y, Z and X at time t = 10, 35, 45 respectively. (10)
   b) Show that, interleaving reduces block transfer time by more than a factor of 2. (10)
   c) A 7 bit data 1100110 is passed and written. After that when reading, we use Hamming correctors and before correcting we get 1100010. How do you detect and correct this one bit error? (15)

8. a) Explain memory hierarchy according to speed, size and cost. (06)
   b) Explain error correcting code function with figure. (10)
   c) Discuss the working procedure of DMA with figure. (14)
   d) "Page should not be two small or too big," explain it. (05)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 2nd Year 1st Term Examination, 2021
Department of Computer Science and Engineering
EEE 2113
Digital Electronics

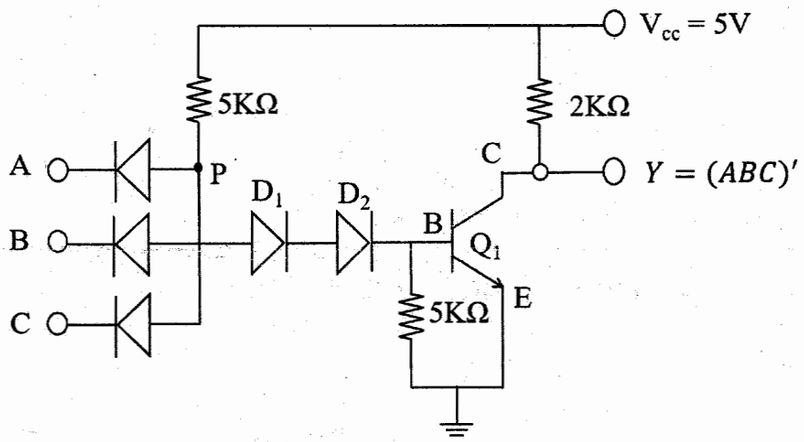
TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define Logic families. What are the governing parameters of the logic families? Briefly explain current sourcing and current sinking with proper example. (10)
   b) Design the following logic functions using CMOS logic: (12)
      i) $Y = (ABC + DEF)'$
      ii) $Y = (A \oplus B)$
      iii) $Y = (A \odot B)$
      Why ECL is faster than TTL?
   c) Connect the output Y of the DTL gate shown in the following figure to N inputs of other similar gates. Assume that the output transistor is saturated and its base current is 0.44 mA. Let $h_{FE} = 20$. (13)



      i) Calculate the current in the 2-KΩ resistor.
      ii) Calculate the current coming from each input connected to the gate.
      iii) Calculate the total collector current in the output transistor as a function of N.
      iv) Find the value of N that will keep the transistor in saturation.
      v) What is the fan-out of the gate?

2. a) Draw the circuit diagram of a TTL gate with totem-pole output and explain it superiority over open collector gate. Also show that "Open collector gates can be tied together to form a common bus". (13)
   b) Draw the 3 input universal logic gates using CMOS logic. (09)
   c) The data sheet of a two-input NAND gate specifies the following parameters: $I_{OH(max.)} = 0.4mA$, $V_{OH(min.)} = 2.7V$, $V_{IH(min.)} = 2V$, $V_{IL(max.)} = 0.8V$, $V_{OL(max.)} = 0.4$, $I_{OL(max.)} = 8mA$, $I_{IL(max.)} = 0.4mA$, $I_{IH(max.)} = 20\mu A$, $I_{CCH(max.)} = 1.6mA$, $I_{CCL(max.)} = 4.4mA$, $t_{PLH} = t_{PHL} = 15ns$ and a supply voltage range of 5V. Determine, (13)
      i) The average power dissipation of a single NAND gate.
      ii) The maximum average propagation delay of a single gate.
      iii) The HIGH-state noise margin and
      iv) The LOW-state noise margin.

3. a) Define the terms: (i) Resolution, (ii) Linearity, and (iii) Settling time. (06)
   b) Explain the operation of dual slope A/D converter. Also draw the block diagram. (10)
   c) For a particular dual slope ADC t_1 is 83.33ms and the reference voltage is 100mV. Calculate t_2 if (i) V_i is 100mV and (ii) 200mV. Also calculate the digital output for case (i) and (ii). (08)
   d) Draw the circuit-diagram for R-2R and binary weighted D/A converter with their output equations. (11)

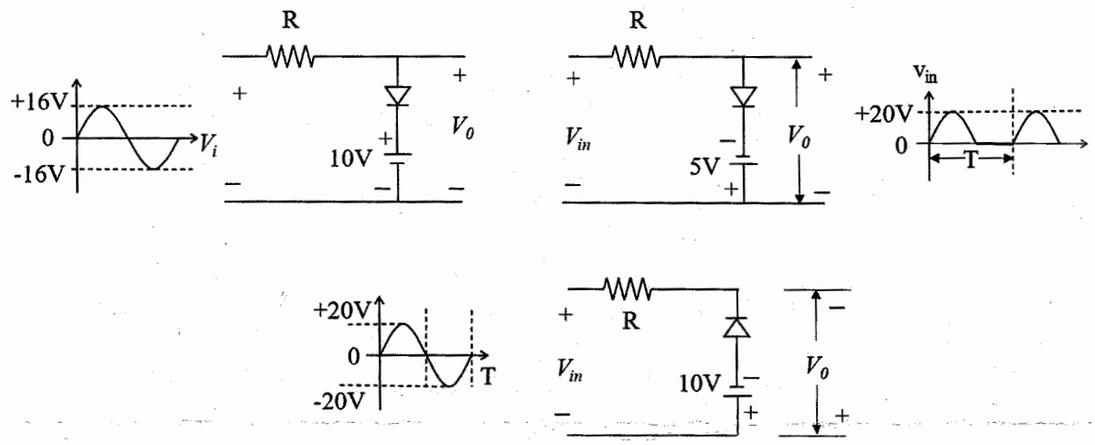
4. a) Define and classify PLDs. Also draw the block diagram of CPLD's and FPGA's with their advantages. (12)
   b) Draw the circuit of a six-transistor based static RAM cell. Also draw the diagram of 4×4 RAM. (08)
   c) Write short notes on: (i) PROM, (ii) EPROM, (iii) EEPROM, (iv) PAL, and (v) PLA. (10)
   d) Design a combinational circuit using a ROM. The circuit accepts a three-bit number and outputs a binary number equal to the square of the input number. (05)

SECTION B

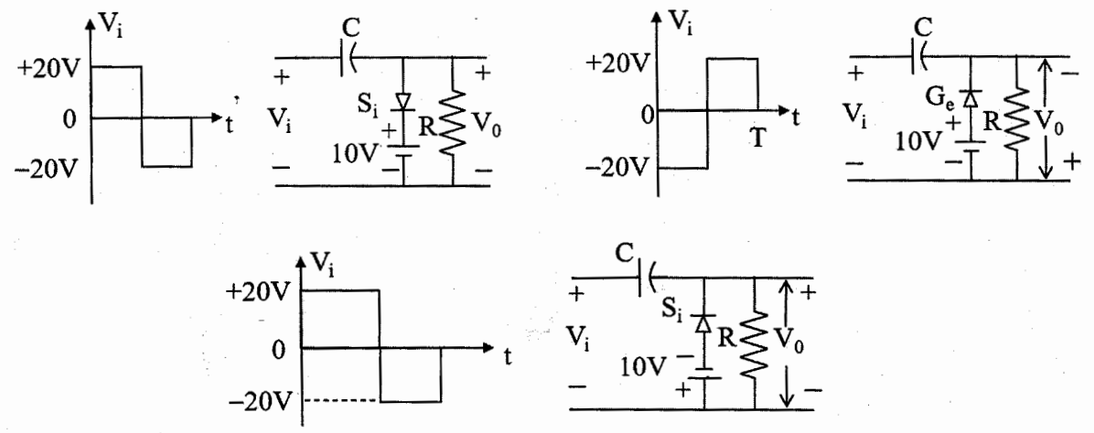
(Answer **ANY THREE** questions from this section in Script B)

5. a) Define comparator circuit. Explain the operation of a window comparator circuit with necessary diagram. Mention why it is named as window comparator? (12)
   b) Classify Op-amp based Schmitt trigger circuit. Explain the operation of a BJT based Schmitt trigger circuit. (12)
   c) Write down the differences between linear and non-linear wave shaping. Show that a high pass filter can act as a differentiator. (11)

6. a) Mention the differences between clipper and clamper circuit. Write down the requirement for designing a clamper circuit. (10)
   b) Draw the output waveform of the following clipper circuit shown in the following figure. (10)



   c) Draw the output waveform of the following clamper circuit shown in the following figure. (10)



   d) Write down the application of multivibrator circuit. (05)

7. a) Define and classify multivibrator circuits. Derive the expression of frequency and duty cycle of an astable multivibrator for 50% duty cycle. (15)
   b) Define commutating capacitor. Explain the necessities of this capacitors in multivibrator circuit. (08)
   c) Consider a linear ramp generator circuit using 555 timer. In this configuration, V_{cc} = 12V, C = 50μF, R_1 = 10K, R_2 = 5K, R_E = 100Ω, V_{be} = 0.6V. Determine the expression of ramp signal and time period, T. (12)

8. a) Define pulse transformer. Mention the application. Draw the equivalent circuit of a pulse transformer. (11)
   b) Draw the circuit diagram, input and output waveshapes of an astable multivibrator circuit. (11)
   c) Write short notes on: (i) DMM, (ii) VTPM, and (iii) Q-meter. (13)