Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering (ICT Institute)
B.Sc. Engineering 1st Year 2nd Semester Examination-2019

Course No: **EEE 155** Course Title: **Electronic Devices and Circuits**
Full Marks: 60 Time: 3 hours

N.B.
i) Answer **SIX** questions, taking any **THREE** from each section.
ii) All questions are of equal values.
iii) Use separate answer script for each section.

SECTION-A

Q.1 (a) Define semiconductor. Write some important properties of semiconductor. 2
(b) What do you mean by a semiconductor diode? Show the V-I characteristics curve of an ideal diode with explanation. 3
(c) Find the voltage V and current I in the circuits shown in figure 1(c). 3

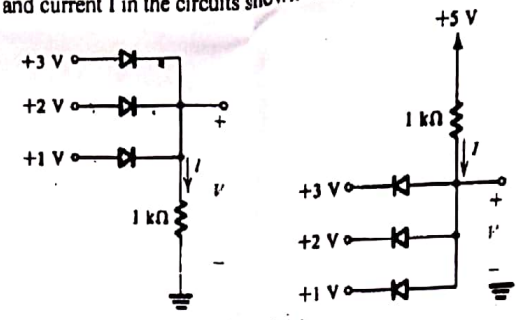


Figure 1(c)

(d) Define photo diode and thermistor. 2

Q.2 (a) What is rectifier diode? 1
(b) Define ripple factor and show that the efficiency of half wave rectifier is 40.6%. 4
(c) Assuming the diodes to be ideal, find the values of I and V in the circuit shown in figure 2(c) 5

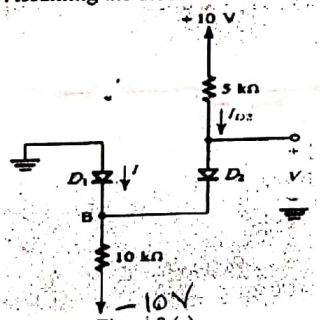


Figure 2 (c)

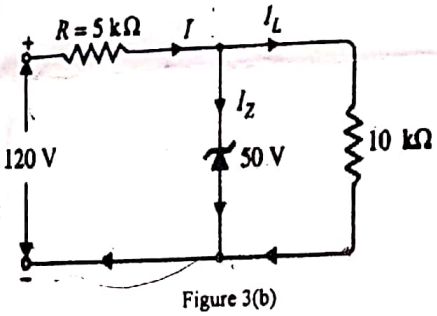


Figure 3(b)

Q.3 (a) Define zener diode. Write down some applications of zener diode. 2
(b) Show that zener diode can be used as a voltage regulator. Find the output voltage across the 10 KΩ resistance of the circuit shown in figure 3(b). 4
(c) Briefly describe the working principle of limiter circuit and a clamper circuit. 4

Q4 (a) What is an operation amplifier? Write down some practical applications of it. 2
(b) What are the characteristics of an ideal Op-Amp? Find out the output voltage of the following circuit shown in figure 4(b). 4

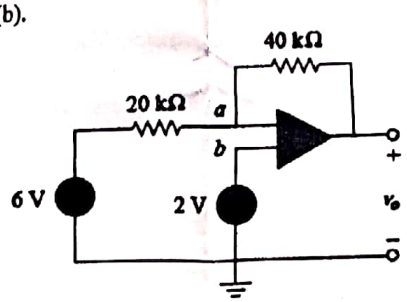


Figure 4(b)

(c) Determine V_o for the network of **figure 4(c)** for the input indicated. 4

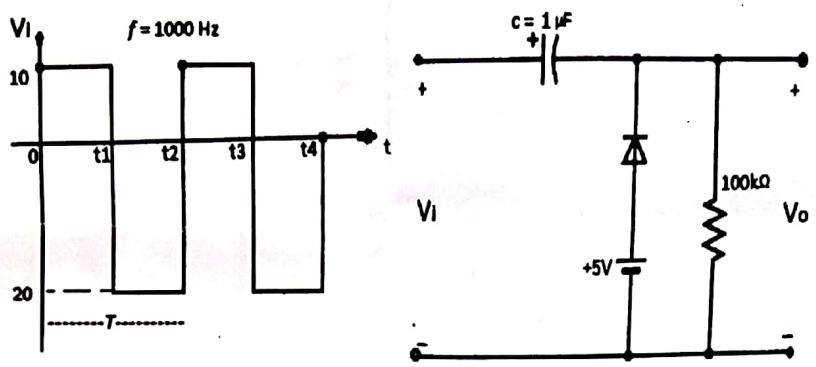


Figure 4(c)

SECTION-B

Q.5 (a) Define CMRR. Draw an integrator circuit by using operational amplifier. 2

(b) Solve the following differential equation by using Op-Amp. 5

$$\frac{d^2x}{dt^2} + 20\frac{dx}{dt} + 100x - 25 = 0$$, where x is the input.

(c) Define current amplification factor and base current amplification factor. Show that $\alpha = \frac{\beta}{\beta+1}$. 3

Q.6 (a) Write the comparison of transistor connections. 3

(b) Draw the output characteristics curve of a common emitter connection of a transistor. For a common emitter connection, show that $I_C = \beta I_B + I_{CEO}$. 4

(c) Find out the base current I_B and collector-emitter voltage V_{CE} of the circuit shown in figure 6(c) 3

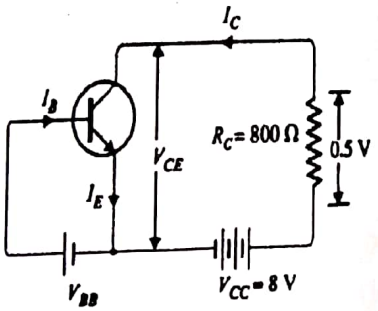


Figure 6(c)

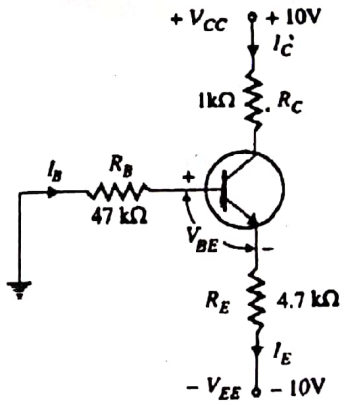


Figure 7(c)

Q.7 (a) Write down the working principle of npn transistor. Also draw the input characteristic curve of CE transistor connection. 4

(b) Define Q point and d.c load line of a transitor. 2

(c) Determine the Q point of the transistor shown in figure 7(c). Also draw the d.c. load line. Given that, $\beta = 100$ and $V_{BE} = 0.7V$. 4

Q.8 (a) Define and classify FET with symbolic diagram. 2

(b) Write down the name of different types of oscillator. Explain the working principle of Wien-bridge oscillator. 5

(c) Draw the equivalent electrical circuit of a crystal. In a Wien-bridge oscillator, $R_1 = R_2 = 220$ KΩ and $C_1 = C_2 = 250$ pF. Determine the frequency of oscillation. 3

END

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Sheikh Hasina Institute of I.C.T.
Department of Computer Science & Engineering
1st year 2nd Semester (B.Sc.) Engineering Examination-2020

Course No: CSE151 **Course Title: Object Oriented Programming**

Full Marks: 60 **Time:** 03 hours

Q.1 (a) Write down some syntactic differences between C and C++ programming? 3

(b) What do the following ***cout*** statements print? Each line represents code in the same program, so if i changes in one row, you should use that new value in the next row(s). 5

```
int i = 0;
cout << ++i;
cout << i++;
cout << i;
cout << (i=-1);
```

(c) Why you use object oriented programming in your software? 2

Q.2 (a) Write a recursion function to calculate $1 + 2 + \cdots + n$. Your function will take a parameter n and returns the summation up to n from 1. 5

(b) What is inheritance? Differentiate between multiple and multilevel inheritances. 3

(c) What are the differences between public, private and protected access modifiers? 2

Q.3 (a) What is the purpose of constructors and destructors? Write three special properties of a constructor that make it distinct from other member functions. 4

(b) Consider the following class 4

```
class Box {
    public:
    int height;
    int weight;
    int length;
};
```

Now complete the class making two different constractors first one without parameter and the second one with parameters of the circle.

(c) Why you use namespace in C++? 2

Q.4 (a) What is a friend function? How does a friend function differ from a member of a class? Explain the reasons of using friend function in C++ programming. 5

(b) What are the possible problems if we use ***'call by value'*** for passing an object to a function? Explain with an example. How can we solve this problem? Explain in details with the example, you provided. 5

Q.5 (a) What is exception? Describe the exception handling mechanism with an example. 5

(b) Why catching all exceptions are required? 3

(c) Why copy contractor is used? 2

Q.6 (a) Why virtual function is used in C++ program? 2

(b) Describe method overloading and overriding with examples. 4

(c) What is an abstract class? Why need to create an abstract class? How many instances are possible to create using abstract class? 4

Q.7 (a) Write a C++ program to overload plus (+) operator for the addition of two vectors. 5

(b) What is data hiding? Describe the data hiding mechanisms in object oriented programming. 5

Q.8 (a) Write a class called ***Adder*** that stores the sum of all the ***ints*** given to it. Your ***Adder*** class should allow you to write the following code (and code like it): 5

```
// sample code
Adder sum1; // sum1 is initialized to 0
Adder sum2(2); // sum2 is initialized to 2
cout << "sum1 is " << sum1 << '\n'; // prints "sum1 is 0"
cout << "sum2 is " << sum2 << '\n'; // prints "sum2 is 2"
sum1 += 5; // adds 5 to sum1; now sum1 is 5
sum2 += -3; // adds -3 to sum2; now sum2 is -1
if (sum1 == sum2)
    cout << "sum1 and sum2 are the same\n";
```

You should only write the functions that are necessary for Adder to be used as in the above program. Use const wherever appropriate, and do not write or use a cast operator. Make sure to include any necessary header files.

(b) Suppose A is a 2-dimensional array of integers with 3 rows and 4 columns. How do you define this variable A in C++? How would you define it and at the same time initialize it to all zero entries? How would you define it and at the same time initialize it to all entries having the value 2? 5

Sheikh Hasina Institute of ICT

Department of Computer Science and Engineering

1st Year 2nd Semester B.Sc. Engineering Examination-2019

Course Code: CSE153 **Course Title: Discrete Computational Theory**

Total Marks: 60 **Time: 3 (Three) Hours**

N.B.: Answer any **SIX** questions from the following **EIGHT** questions.

1. a) What is proposition? 1
   b) What are the negations of the statements "There is an honest politician" and "All Americans eat cheeseburgers"? 2
   c) Let A={1, 2, 3, 4}. Determine the truth value of each of the following statements. 3
      (i) $(\exists x \in A)(x+3=10)$ (ii) $(\forall x \in A)(x+3<10)$
      (iii) $(\exists x \in A)(x+3<5)$ (iv) $(\forall x \in A)(x+3<7)$
   d) Show that $\neg (p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences. 4

2. a) Use Euclid's algorithm to compute gcd(92928, 123552). 3
   b) Prove that $(((\neg p \vee q) \rightarrow r) \wedge r \rightarrow (s \vee t)) \wedge (\neg s \wedge \neg u) \wedge (\neg u \wedge \neg t)) \rightarrow p$. (prove by contradiction). 3
   c) Find the records of computer science department in the *n*-ary relation R shown in table 1. 2

Table 1:Teaching Assignment

Professor	Department	Course_Number
Cruz	Computer science	335
Cruz	Computer science	412
Farber	Psychology	501
Rosen	Mathematics	575

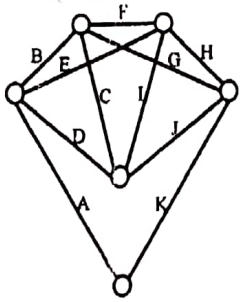
   d) Perform the join operation on table 1 and table 2. 2

Table 2: Class_schedule

Department	Course_Number	Room	Time
Mathematics	575	N502	3:00PM
Psychology	501	A100	3:00PM
Computer science	335	A100	9:00PM
Computer science	412	A100	8:00PM

3. a) Let U = {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20}, what bit strings represent the subset of all odd integers in U and the subset of integers not exceeding 10 in U? 4
   b) Find the number of relations from A={a,b,c} to B={1,2}. 2
   c) Consider the following relation R on the set A={1,2,3}; R={(1,2),(2,3),(3,3)} 4
      i) Find reflexive(R)
      ii) Find symmetric(R) and
      iii) Find transitive(R)

4. a) What are strongly and weakly connected graphs? Give examples. 2
   b) How will you count the number of paths between two vertices? 2
   c) Is $K_{3,3}$ planar? 2
   d) What is Euler circuit? Draw the Euler Cycle from the graph if it is possible otherwise draw the Euler path. 3



5. a) State whether or not each of the following relations is a function from A={a,b,c} into B={x,y,z}. 3

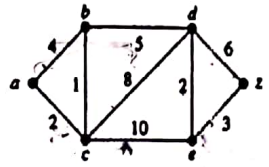
i) f={(a,y), (c,x)}
ii) g={(a,y), (b,z), (c,x), (c,z)}
iii) h={(a,x), (b,z), (c,x)}

b) Consider A={a,b,c,d} and B={1,2,3} and the function f:A→B with f(a)=3, f(b)=2, f(c)=1 and f(d)=3. Examine whether the function f is to be one-to-one, onto or one-to-one correspondence. 3

c) Define tautology and contradiction. 2

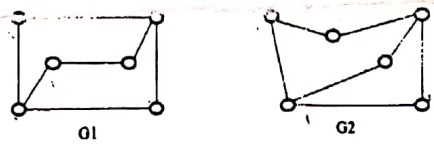
d) Let f be the function from Z to Z with $f(x) = x^2$. Is f invertible? 2

6. a) What is the length of the shortest path from a to z in the following weighted graph? 4



b) Define Complete graph and Bipartite graph with example. 3

c) Prove the isomorphism of the following two graphs G1 and G2. 3



7. a) What is complete binary tree? Give figure. 1

b) Define binary search tree. How will you insert a data item in binary search tree? 2

c) Suppose the preorder and inorder traversals of a binary tree T yield the following sequence of nodes: 3

Preorder: G, B, Q, A, C, K, F, P, D, E, R, H
Inorder: Q, B, K, C, F, A, G, P, E, D, H, R

i) Draw the diagram of T.
ii) Find the depth d of T.
iii) Find the descendants of B.
iv) List the terminal nodes of T.

d) Consider the algebraic expression $E=(2x+y)(5a-b)^3$ 4

i) Draw the tree T which corresponds to the expression E.
ii) Find the preorder, inorder and postorder of T.

8. a) Find whether 157 is prime or not using the brute-force algorithm. 3

b) What is Hash function? Locate different items having the following ids in an array of size 8. 4
ID: 365, 243, 142, 193, 286, 392.

c) The message "ROVVY HYCVN" was encrypted with the Caesar cipher using $s = 10$. 3
Decrypt it.

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Sheikh Hasina ICT Institute
Department of Computer Science and Engineering
1st year 2nd Semester B.Sc. (Engg.) Final Examination-2020
Course Title: Coordinate Geometry & Ordinary Differential Equation, Course Code: MAT 155
Time: 3 Hours **Total Marks: 60**

(Answer any SIX (06) questions from each section. All parts of a question must be answered sequentially. The figures in the right margin indicate the marks for each question)

1. (a) Determine the transformation in the co-ordinates of a point when the direction of axes is turned through an angle θ whereas the origin of co-ordinates remains same. 5
   (b) Find the transformation equation of $5x^2+6xy+5y^2-4x+4y-4=0$ when origin is shifted $(1,-1)$ and the axes is turned through an angle 45^0. 5

2. (a) Show that the equation $ax^2+2hxy+by^2+2gx+2fy+c=0$ represent two parallel lines if $\frac{a}{h}=\frac{h}{b}=\frac{g}{f}$. 5
   (b) Define direction cosine and direction ratio. Find the distance of $(-2,3,4)$ from the line through the point $(-1,3,2)$ whose direction cosines are proportional to $12,3,-4$. 5

3. (a) Find the nature of the conic $8x^2+4xy+5y^2-24x-2y=0$. Reduce it to the standard form. Find the vertex, focus and length of latus rectum of the conic. 5
   (b) Find the equations of line perpendicular to both the line $\frac{x-1}{1}=\frac{y-1}{2}=\frac{z+2}{3}$ and $\frac{x+2}{2}=\frac{y-5}{-1}=\frac{z+3}{2}$ and passing through their intersection. 5

4. (a) Define Plane. Show that the four points $(0,-1,-1),(4,5,1),(3,9,4)$ & $(-4,4,4)$ are coplanar. 4
   (b) Prove that the equation $x^2-5xy-6y^2+14x+5y+4=0$ represents a pair of straight lines. Find also their point of intersection and the angle between them. 3
   (c) Find the equation of a plane passing through the points $(2,2,1)$ and $(9,3,6)$ and is perpendicular to the plane $2x+6y+6z=9$. 3

5. (a) What do you mean by exact differential equation? State and Prove the necessary condition for an equation to be exact differential equation. 5
   (b) What is Bernoulli's equation? Solve the linear differential equation $(1+x^2)\frac{dy}{dx}+y=\tan^{-1}x$. 5

6. (a) Find the solution of the differential equation $x^2\frac{d^2y}{dx^2}-3x\frac{dy}{dx}+4y=0$. 5
   (b) Solve: $\frac{d^2y}{dx^2}-4\frac{dy}{dx}+4y=x^2e^{2x}$. 5

7. (a) Find the particular solution of $\frac{d^2y}{dt^2}+6\frac{dy}{dt}+9y=27e^{-6t}$ when $y(0)=-2$, $y'(0)=0$. 4
   (b) Solve: (i) $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=xe^x\sin x$ (ii) $\frac{d^2y}{dx^2}-4\frac{dy}{dx}+4y=x^2e^{2x}$ 6

8. (a) Solve the differential equation $\frac{d^2\theta}{dt^2}+4\theta=4\tan 2t$ by the method of variation of parameter. 5
   (b) A 30 Volt electromotive force is applied to an LR series circuit in which the inductance is 0.2 henry and the the registance is 50 ohms. Find the current $I(t)$ if $I(0)=0$. Determine the current after a long time. 5

Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj

Department of Computer Science & Engineering, ICT

1st Year 2nd Semester B.Sc. Engineering Final Examination-2019

Course Title: Bangabandhu in Science and Technology **Course No: BST155**
Full Marks: 60 **Time: 3 hours**

N.B.
i) Answer any **FIVE** questions from the following.
ii) All questions are of equal values.

Q.1	"Bangabandhu is the founder father of Bangladesh" – critically discuss the statement in context of Bangladesh.	12
Q.2	Discuss the socio-cultural features of the people of Bangladesh.	12
Q.3	Six points movement "The Magna Carta" of Bangalees – explain it.	12
Q.4	Analyze the political philosophy of Bangabandhu Sheikh Mujibur Rahman.	12
Q.5	Discuss the salient features of the constitution of Bangladesh in 1972.	12
Q.6	Analyze the role of superpowers during the liberation war of Bangladesh.	12
Q.7	Write down short notes of the following topics (any two) a) 7th March Speech of Bangabandhu b) Agartala Conspiracy Case c) Mujibnagar Government	12