Course Title: **Object Oriented Programming**
Full Marks: 60
N.B.

Course Code: **CSE 151**
Time: **3(Three) Hours**

i) Answer any **SIX** questions.
ii) All questions are of equal values.

Q.1 (a) Explain the characteristics of Object Oriented Programming (OOP).

(b) Briefly describe Encapsulation, Polymorphism, and Inheritance with real life example. 2

(c) class A 4
```
class A
{
    int a, b, c;
public:
    A(int x, int y, int z){a=x; b=y; c=z;}
};
```
4

You are asked to access the properties a, b, c and add 10 to all of them (eg. a=a+10) from class B. Write necessary codes in class A and class B to complete the task.

Q.2 (a) Define class and object. 2

(b) Differentiate public, private and protected members in C++ with example. 4

(c) Suppose you are building an app for a *Box* manufacturing company. The Boxes have *Length*, 4
Height and *Width*. When a client orders for a box, the size (e.g. Length, Height and Width) is given by the client. If no value of the size is mentioned by the client, you construct the *Box* with:

$Length = 10$
$Height = 02$
$Width = 05$

Now, demonstrate the attributes of *Box* using C++ language. Then, create ten boxes for client1 (where the client didn't mention the size) and one box for client2 (where client given the Length=30, Height = 10, Width = 10).

Q.3 (a) What is constructor and destructor? When they are execute? Explain with example. 2

(b) Create a class called triangle the find the area of triangle from base and height. You have to 4
use parameterized constructor to set the value of base and height.

(c) Consider the following program: 4

```
#include<iostream>
using namespace std;
class Line
{
    public:
    double length;
    Line()
    {
        cout<<"object is being created"<<endl;
    }
    ~Line()
    {
        cout<<"object is being created"<<endl;
    }

};

int main()
{
    Line ob1, ob2, ob3;
    cout<< "Thank you" <<endl;
    return 0;
}
```
Now, find the output of this program.

Q.4 (a) Define C++ friend function. 2

(b) What is copy constructor? Explain with example. 3

(c) Consider the following class: 5

```
class Box
{
    double width;
    public:
    friend void printWidth( Box ob );
    void setWidth( double wid );
};
```

Now, complete the program that will print the width of a box using friend function.

Q.5 (a) Write down the differences between early and late binding. 2

(b) Write short description on Multiple Inheritance and diamond problem in C++ with proper example. 4

(c) We know that a private member of a base class is not inheritable. Is it anyway possible for the objects of derived class to access the private member of the base class? If yes, how? Explain with C++ program. Remember, the base class cannot be modified. 4

Q.6 (a) What is inheritance? Explain with an example. 2

(b) What does 'this pointer' do? Explain using an example. 2

(c) There is a class named "Person" with properties such as Name, BloodGroup. There is another class named "Student" with properties such as ID, BatchNO. Again, there is a class named "Faculty" with properties such as Position, RoomNo. Remember, students and faculties are also person. Now, create a class name "TeachingAssistant", which contains all features of student and faculty classes. Initialize values using constructors and create a teaching assistant from main method with any sample data. Show complete code. What type of inheritance is needed to create the TeachingAssistant class? 6

Q.7 (a) How many ways can function overloading be done? Give examples of each possible way using code. 3

(b) What is an inline function? Why is it used? Illustrate with an example. 3

(c) What is virtual function? Explain run time polymorphism with an example. 4

Q.8 (a) Define Exception handling. Briefly describe the exception handling mechanism with example. 4

(b) What is a scope resolution operator? Why is it used in C++? 2

(c) What is Operator overloading? Explain with an example? 4

Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science & Engineering
1st Year 2nd Semester B.Sc. Engineering Examination-2019
Course Code: CSE153   Course Title: Discrete Computational Theory
Full Marks: 60   Time: 3 hours
N.B. Answer any SIX questions. All questions are of equal values. Answer all the question sequentially.

1. a. What is Tree? Write down the difference between Tree and Binary Tree.   2

    b. Prove that there are infinitely Natural Numbers. Prove that every non-   3
       prime numbers are product of prime numbers.

    c. Construct a Complete Binary Tree (where right side nodes will be greater   5
       than root or sub root and left side nodes will be less than or equal root or
       sub root) 1, 3, 4335, 6, 7888, 99999, 4444, 4444444, 82402, 12, 12, 2132,
       4, 222, 787, 78, 52, 21, 26, 45, 78, 19. Write down the Preorder and
       Postorder of the Tree.

2. a. Write down the difference between Constructive and Contrapositive proof.   2

    b. i. Let p be the statement "Maria learns discrete mathematics" and q the   4
       statement "Maria will find a good job". Express the statement p→q as a
       statement in English
       ii.. Let p be the statement "You can take the flight" and let q be the
       statement "You buy a ticket". Express the statement p ↔ q as a statement
       in English.

    c. Consider an undirected random graph of eight vertices. The probability   4
       that there is an edge between a pair of vertices is 1/2. What is the expected
       number of unordered cycles of length four? What is the chromatic number
       of an n-vertex simple connected graph which does not contain any odd
       length cycle? Assume n>-= 2.

3. a. Write the properties of one-to-one and onto. Let A= {a, b, c, d} and B=   4
       {1, 2, 3, 4}. Determine whether the following functions are one-to-one,
       onto or both.

       (i) f(a) = 1, f(b) = 3, f(c) = 1 (ii) f (a)=3, f(b)=1, f(c)=3, f(d) =2 (iii) f (a)=4,

       f(b)=1, f(c)=3, f(d) =2 (iv) f (a)=2, f(b)=1, f(c)=2, f(d) =3.

    b. What is the number of possible words that can be made using the word   4
       "EASYQUIZ" such that the vowels always come together? In how many
       ways can an interview panel of 3 members be formed from 3 engineers, 2
       psychologists and 3 managers if at least 1 engineer must be included?

    c. Write down the use of chromatics number. Find out the chromatic number   2
       of 10 vertices wheel graph.

4. a. Write down the difference between Hamiltonian Circuit and Euler Circuit?   3
       Write down the difference among path, circuit and trail.

    b. Draw the Hamiltonian and Euler Circuits from the Graph if it is possible   7
       otherwise draw the Hamiltonian and Euler Path. (Give the vertex no. as
       following 1, 2, 3,.........)
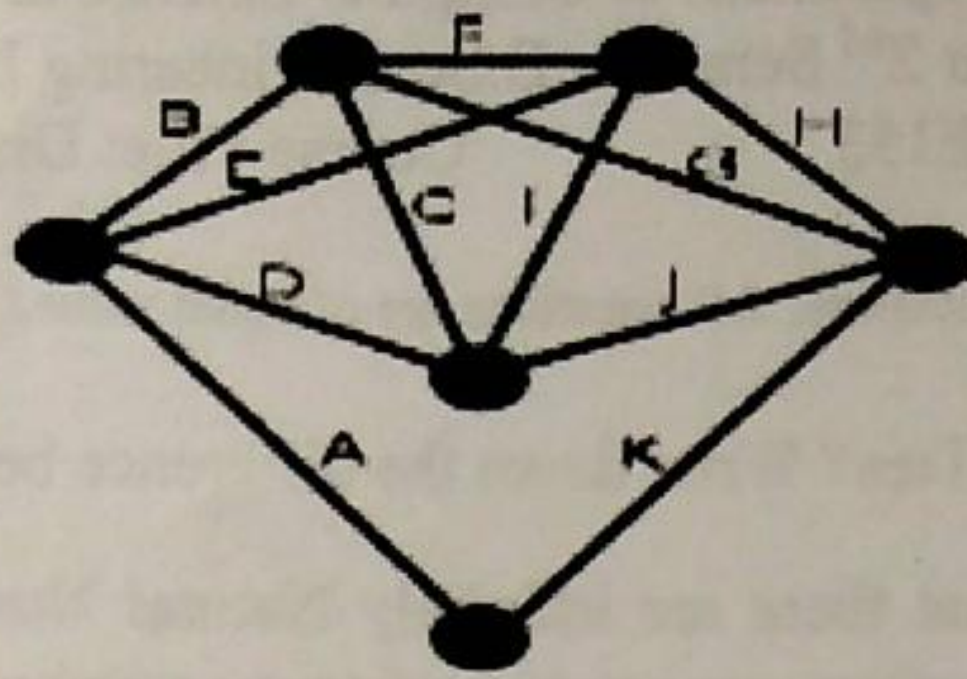
5.
  a. Define tautology, contradiction and contingency by considering suitable example. Show that $(p \rightarrow q) \land (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology   4

  b. (Set of integers,*) is always Groups or not? Give prove against the statement.   2

  c. What is proposition? Give an example which is not proposition. What is pigeon hole principle? Briefly explain about it with proper example.   4

6.
  a. Consider the following relations on {1,2,3,4} to decide whether it is reflexive, whether it is symmetric, whether it is anti-symmetric and whether it is transitive.   4
R1={(1,1)}, (1,2), (2,1), (2,2), (3,4), (4,1), (4,4)}
R2={(1,1)}, (1,2), (2,1)}
R3={(1,1)}, (1,2), (1,4), (2,1), (2,2), (3,3), (4,1), (4,4)}
R4={(2,1), (3,1), (3,2), (4,1), (4,2), (4,3)}

  b. What are the contrapositive, the converse, and the inverse of the conditional statement "The home team loses whenever it is not raining?"   2

  c. Draw Hasse diagram for 3, 6, 9, 12, 15, 18, 21, 24, 27, 30 which support dividing operation.   4

7.
  a. Define binary search tree. Form a binary search tree for the words *mathematics, physics, geography, zoology, meteorology, geology, psychology and chemist* **(using alphabetical order).**   4

  b. "A graph with n vertices has at most n (n-1)/2 edges" Prove the statement.   3

  c. Prove that $\sqrt{2}$ is irrational. Prove that every tree is forest but every forest is not tree.   3

8.
  a. Write down the difference between finite and infinite graph. (i) How many ways are there to make a sum of 10 using exactly one element from each of the following two sets: {2, 3, 6, 7} and {3, 4, 5, 8}? (ii) How many solutions in non-negative integers does the equation a+b+c=20 have?   5

  b. What is bi partite graph? Give proper example. (i)A box contains 6 red, 8 green, 10 blue, 12 yellow and 15 white balls. What is the minimum no. of balls we have to choose randomly from the box to ensure that we get 9 balls of same color? (ii)In how many ways can 4 drinks can be chosen out of 6 possible types of drinks? There is no restriction on the number of drinks of a type that can be chosen and drinks of the same type are indistinguishable.   5
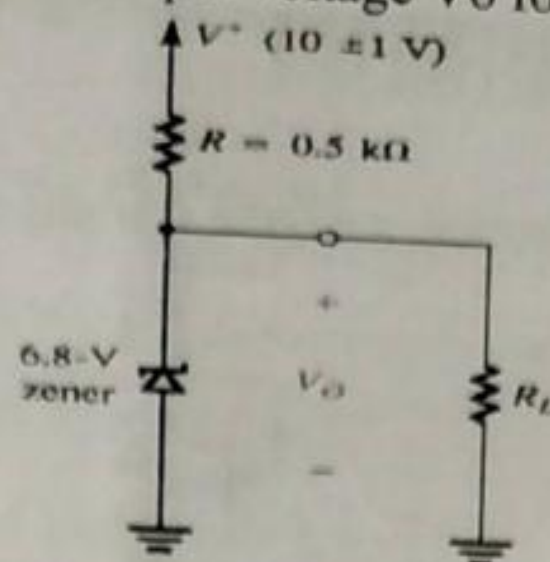
Course Code: EEE155
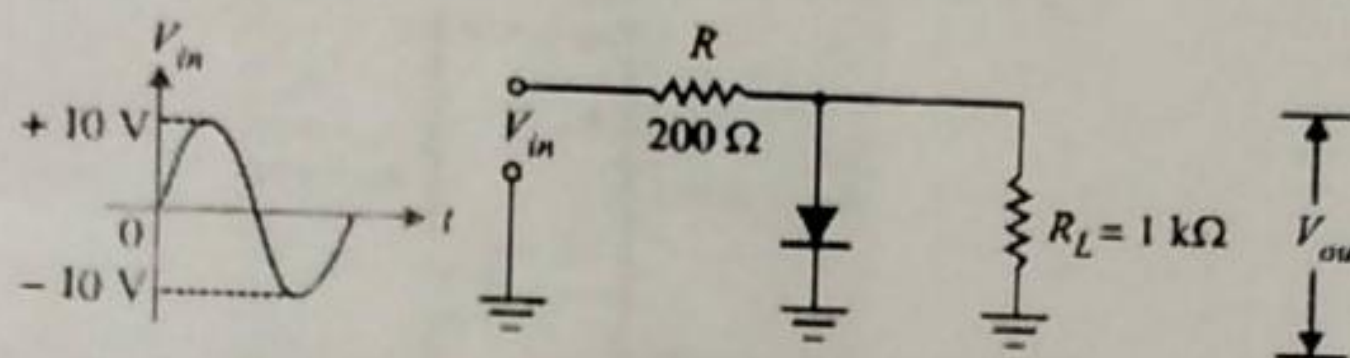Course Title: Electronic Devices and Circuits

Full marks: 60
Time: 3 hours

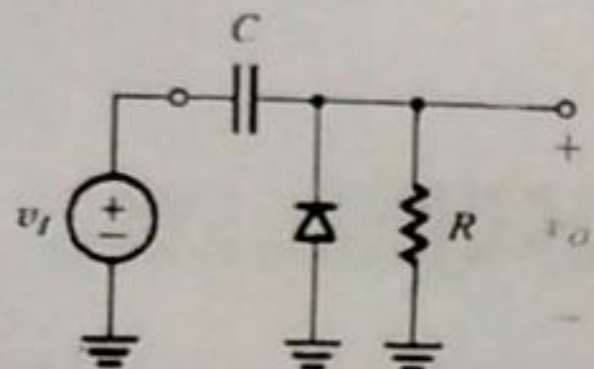N. B. Answer any Six question form each section and All question are of equal marks.

1. (a) Draw and explain the V-I characteristics of a pn junction. Write short notes on the followings:(i) Breakdown voltage and (ii) Knee voltage   3

(b) The 6.8-V Zener diode in the circuit of following figure is specified to have $V_Z = 6.8$ V at $I_Z = 5$ mA, $r_z = 20$ ohm, $I_{ZK} = 0.2$ mA and R= 0.5k ohm. Find the output voltage Vo for no load and when $R_L = 2k$ ohm.   3

(c) With necessary circuit diagrams explain the working principle of Centre-tap full wave rectifier.   4

2. (a) Show the circuit diagram and transfer characteristic of a precision half wave rectifier.   2

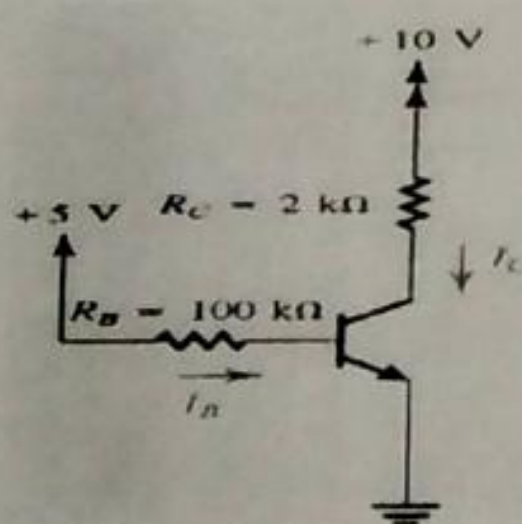(b) Draw the output voltage wave shape of the following circuit: 4

(c) For a 2V p-p square wave at the input, find the output waveform of the following circuit   4

3. (a) Describe BJT's four modes of operation using a simplified structure of an npn transistor.   5

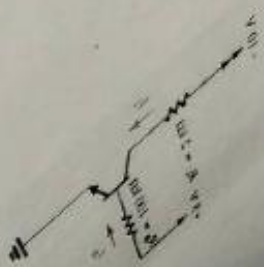(b) Find the currents through all branches and voltages at all nodes of the following circuit.   5

4. (a) Find IB, IC and collector voltage of the following circuit.   5

(b) What is difference amplifier? Draw the circuit diagram and write down the voltage gain of a difference amplifier. Derive the output equation of an inverting amplifier.   5
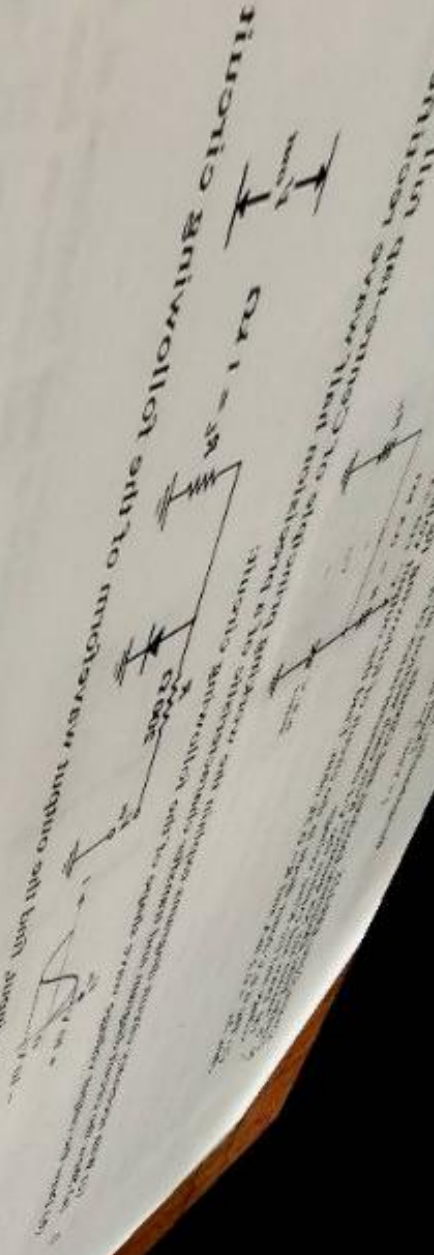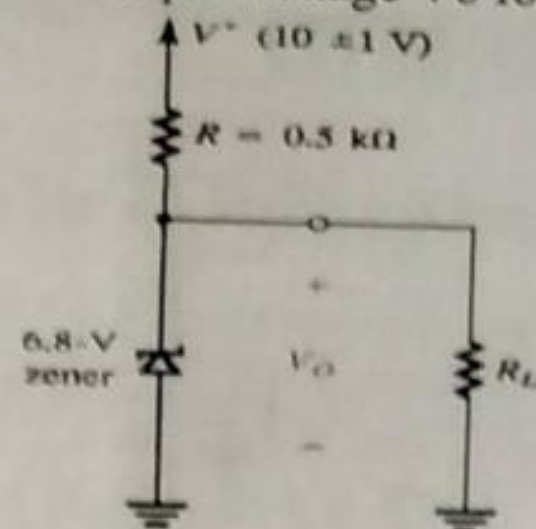
Course Code: EEE155
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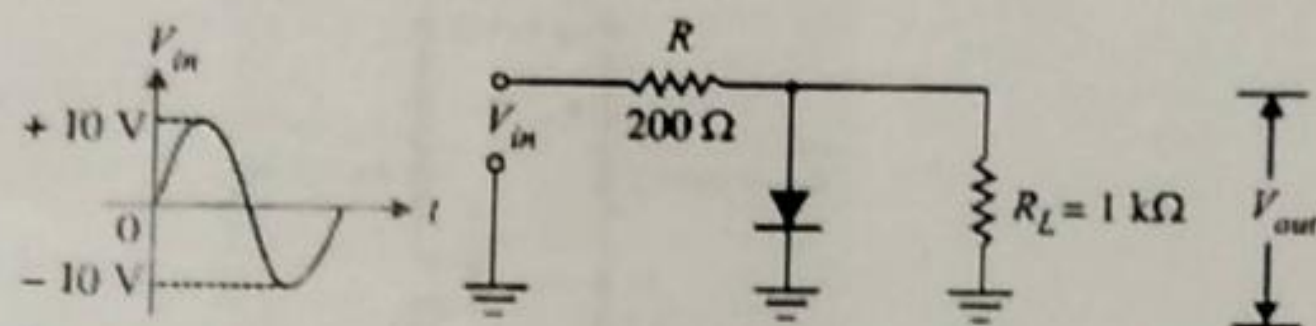
Full marks: 60
Time: 3 hours

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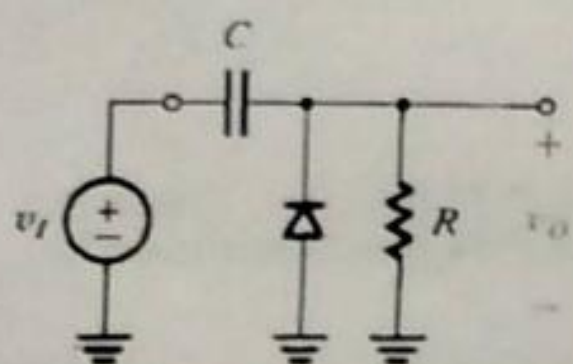   voltage and (ii) Knee voltage

   (b) The 6.8-V Zener diode in the circuit of following figure is specified to have $V_Z = 6.8$ V at $I_z = 5$ mA, $r_z = 20$ 3
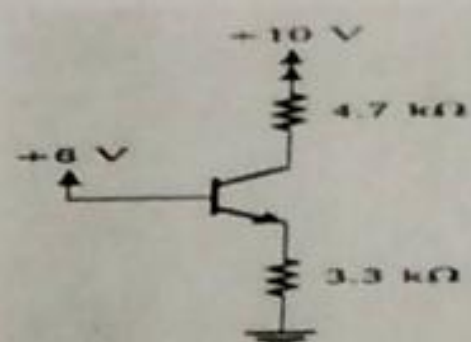   ohm, $I_{ZK} = 0.2$ mA and R= 0.5k ohm. Find the output voltage Vo for no load and when R_L=2k ohm.

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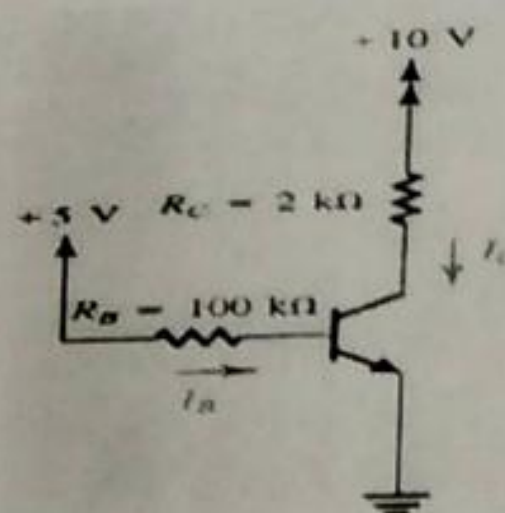   (b) Draw the output voltage wave shape of the following circuit: 4

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Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science & Engineering
1st Year 2nd Semester B.Sc. Engineering Examination 2019
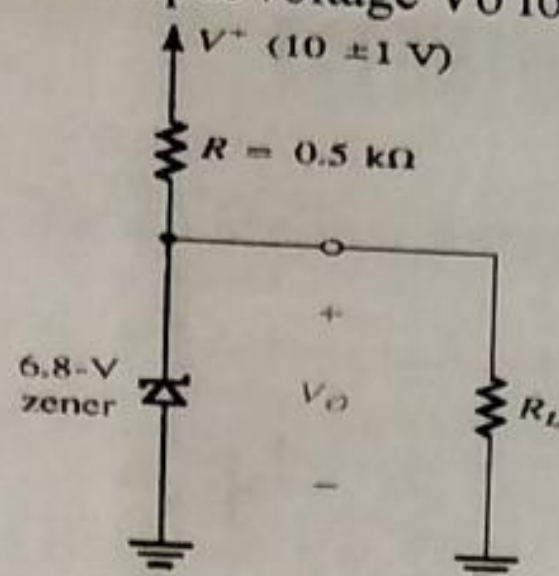
Course Code: EEE155
Course Title: Electronic Devices and Circuits
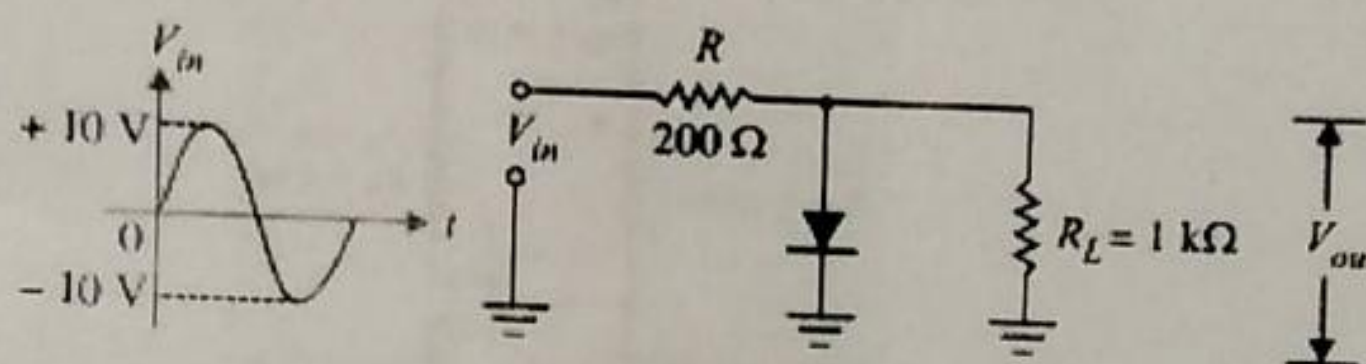
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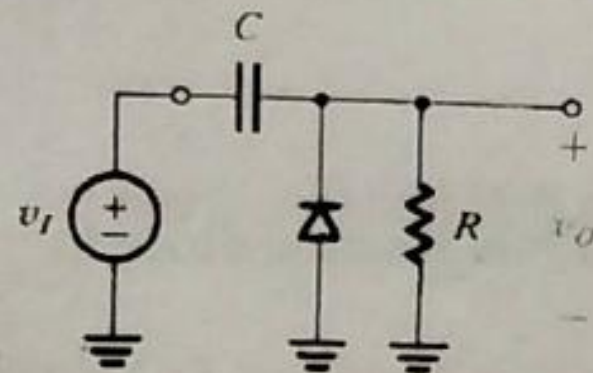
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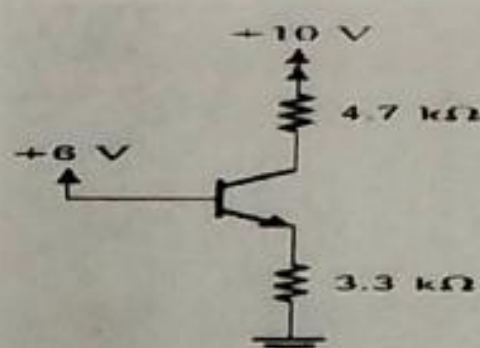

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3. (a) Describe BJT's four modes of operation using a simplified structure of an npn transistor.   5

(b) Find the currents through all branches and voltages at all nodes of the following circuit.   5

4. (a) Find IB, IC and collector voltage of the following circuit.   5

(b) What is difference amplifier? Draw the circuit diagram and write down the voltage gain of a difference amplifier. Derive the output equation of an inverting amplifier.   5

5. (a) Consider an NMOS transistor fabricated in a 0.18-nm process with $L = 0.18$ μm and $W = 2$ μm. The process technology is specified to have $C_{ox} = 8.6$ fF/μm^2, $\mu_n = 450$ cm^2/V.s and $V_t = 0.5$ V. If $V_{GS} = V_{DS} = 0.72$ V.   4

    i.   Find I_D

    ii.   If V_{GS} is kept constant find V_{DS} that will results in $I_D = 50$ μA

(b) Explain channel length modulation. Draw the I_D-V_{DS} characteristics for an enhancement-type NMOS transistor for different gate voltages. Also indicate the triode and saturation region in the diagram.   4

(c) Draw the CMOS implementation of an inverter circuit.   2

6. (a) With proper diagram explain the physical operation of an n channel enhancement type MOSFET.   3

(b) For the circuit in following figure find the value of R that results in $V_D = 0.8$ V. The MOSFET has $V_t = 0.8$ V, $\mu_n C_{ox} = 0.4$ mA/V^2 and $(W/L) = 4$.   3
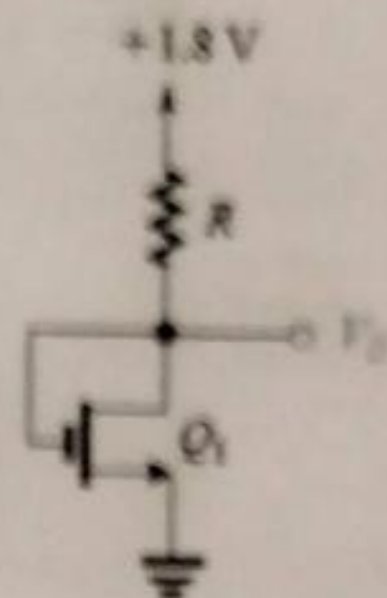
(c) Analyze the following circuit to determine the currents through all branches and voltages at all nodes. Assume $V_t = 1$ V, $k'_n(W/L) = 1$ mA/V^2. Neglect the channel length modulation effect.   4
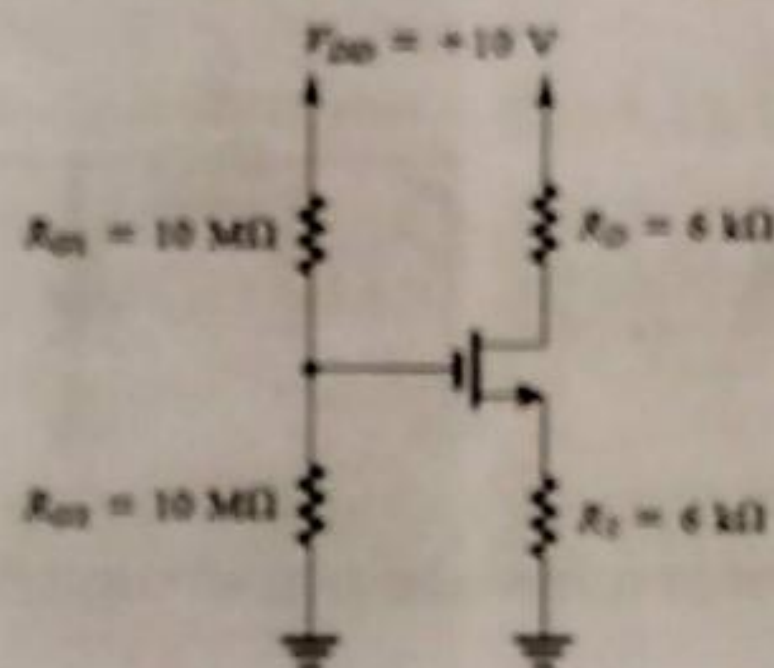
7   (a) What is intrinsic and extrinsic semiconductor? Explain the operation of a P-N junction diode in forward and reverse bias.   3

(b) What is meant by 'Energy bands'? Briefly explain: valance band, conduction band and forbidden energy gap.   3

(c) Write short notes on   4

    i.   Zener diode
    ii.   Tunnel diode
    iii. LDR
    iv. Varactor diode

8   (a)Explain Barkhausen criterion.   2

(b)Write down the properties of an ideal Op-amp.   2

(c)Derive the expression of voltage gain of a noninverting amplifier.   4

(d) Draw the circuit diagram of an inverting differentiator amplifier.   2

Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj

Department of Computer Science & Engineering
1st year 2nd Semester B.Sc.Engg. Final Examination

Course Title: Bangabandhu in Science and Technology

Full Marks: 60

Course Code: BST155

Time: 3 Hours

Answer any six of the following questions

1. Analyze the strategy and tactics of the liberation war of Bangladesh.   10

2. "Bangabandhu Sheikh Mujibur Rahman is the greatest Bangalee of thousand years"- Explain the statement in the light of his life and works.   10

3. Explain the political thought of Bangabandhu Sheikh Mujibur Rahman.   10

4. What do you mean by "Six point movement"? "Six point movement leads to the independence of Bangladesh in 1971" - Explain   10

5. Discuss the various phases of liberation war of Bangladesh in 1971.   10

6. Discuss the role of big powers during the liberation war of Bangladesh.   10

7. Analyze the strategies of the liberation war of Bangladesh in1971   10

8. Discuss the salient feature of the constitution of Bangladesh in 1972.   10

Good Luck

Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science and Engineering
1st Year 2nd Semester B.Sc. (Engg.) Final Examination-2019
Course No.:MAT155   Course Title: Co-Ordinate Geometry and Ordinary Differential Equation
Full Marks: 60
Time: 03 hours
N.B.

i) Answer any **SIX** questions out of **EIGHT**.
ii) All questions are of equal values.

1. a) Determine the transformation in the co-ordinates of a point when the direction of axes is   5
        turned through an angle θ whereas the origin of co-ordinates remains same.

    b) Transform the equation $11x^2 + 24xy + 4y^2 - 20x - 40y - 5 = 0$ to rectangular axes through the   5

        point $(2, -1)$ and inclined at an angle $\tan^{-1}\left(-\frac{4}{3}\right)$.

2. a) Obtain the general condition that the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ 5
        represent a pair of straight lines and also determine the angle between the straight lines.

        Also, show that the equation $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$ represents a pair of
        straight lines.

    b) Find the nature of the conic $5x^2 - 2xy + 5y^2 - 8x - 8y - 8 = 0$. Reduce it to the standard   5
        form and find the equation of the axes and its length if possible.

3. a) Find an equation of the plane passing through the point $(3, -1, 7)$ and perpendicular to the   2
        vector $\vec{n} = \langle 4, 2, -5 \rangle$.

    b) Determine whether the line $\frac{x-3}{8} = \frac{y-4}{5} = \frac{z+3}{-1}$ is parallel to the plane $x - 3y + 5z = 12$.   4
        Find the intersection of this line and plane.

    c) Find the acute angle of intersection between the two planes $2x - 4y + 4z = 6$ and $6x +$ 4
        $2y - 3z = 4$. Find the vector equation of the line of intersection of these planes.

4. a) Determine the equation of sphere with its centre at $(-4, 2, 3)$ and tangent to the plane   3
        $2x - y - 2z + 7 = 0$.

    b) Find the equations of the plane through the point $(2,2,1)$ and $(9,3,6)$ and perpendicular to   3
        the plane $x - y + 2z - 5 = 0 = 3x + y + z - 6$.

    c) Obtain the equations of the tangent planes to the sphere $x^2 + y^2 + z^2 + 6x - 2z + 1 = 0$ 4

        which pass through the line $\frac{16-x}{2} = \frac{z}{2} = \frac{y+15}{3}$.

5. a) Form the differential equation from the curve $y = Ae^{-3x} + Be^{3x}$. Write down the order and   4

        degree of the following differential equations: **i.** $\frac{d^2y}{dx^2} = k\left(1 + \frac{dy}{dx}\right)^{\frac{5}{3}}$ **ii.** $\left(\frac{d^2y}{dx^2}\right)^{\frac{2}{5}} + y = k\left(\frac{dy}{dx}\right)^{\frac{5}{2}}$

    b) Define integrating factor and exact differential equation. Also, Solve: 6

        (i) $(1+x^2)\frac{dy}{dx} + y = \tan^{-1}x$ **(ii)** $(4x+3y-5)dx + (3x+4y+1)dy = 0$

6.   Solve the following differential equations: 10

(i) $x\sqrt{1-y^2}\,dx + y\sqrt{1-x^2}\,dy = 0$ (ii) $(x^2+y^2)dx - 2xy\,dy = 0$ (iii) $\dfrac{d^2y}{dx^2} - 5\dfrac{dy}{dx} + 6y = 0$

7. a) Solve: $(D^2 - 5D + 6)y = 3x^2$.

   b) Use the method of undetermined coefficients to find the solution of the given initial value problem.

   3
   3.5

   $$y''' + 4y' = 4 + 8t, \qquad y(0) = 0, \qquad y'(0) = 0, \qquad y''(0) = 2$$

   c) Find the general solution of the following DE by variation of parameter method:

   3.5

   $$y'' + y = \tan t, \quad 0 < t < \pi/2.$$

8. a)

   Solve the differential equation $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} = e^x \sin x$ 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 registance is 50 ohms. Find the current I(t) if $I(0)=0$. Determine the current after a long time.

   5

(i) $x\sqrt{1-y^2}\,dx + y\sqrt{1-x^2}\,dy = 0$

(ii) $(x^2 + y^2)dx - 2xy\,dy = 0$

(iii) $\dfrac{d^2y}{dx^2} - 5\dfrac{dy}{dx} + 6y = 0$

7. a) Solve: $(D^2 - 5D + 6)y = 3x^2$.

   3

   b) Use the method of undetermined coefficients to find the solution of the given initial value 3.5
   problem.

   $$y''' + 4y' = 4 + 8t, \qquad y(0) = 0, \qquad y'(0) = 0, \qquad y''(0) = 2$$

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   Solve the differential equation $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} = e^x \sin x$ by the method of variation of parameter.

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