

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

1. (a) What is constructor and destructor? When they are executed? Explain with example. 3
(b) What is the relationship between class and object? Explain with an example. 3
(c) Can `main()` be overloaded in C++? Predict the output of following C++ programs. 4

i)

```
#include <iostream>
using namespace std;
int main(int a)
{
    cout << a << "\n";
    return 0;
}
int main(char *a)
{
    cout << a << endl;
    return 0;
}
int main(int a, int b)
{
    cout << a << " " << b;
    return 0;
}
int main()
{
    main(3);
    main("C++");
    main(9, 6);
    return 0;
}
```

ii)

```
#include <iostream>
using namespace std;
class Test
{
public:
    int main(int s)
    {
        cout << s << "\n";
        return 0;
    }
    int main(char *s)
    {
        cout << s << endl;
        return 0;
    }
    int main(int s, int m)
    {
        cout << s << " " << m;
        return 0;
    }
};
int main()
{
    Test obj;
    obj.main(3);
    obj.main("I love C++");
    obj.main(9, 6);
    return 0;
}
```

2. (a) Consider the following class: 3

```
class Box
{
public:
    double length; // Length of a box
    double breadth; // Breadth of a
    box
    double height; // Height of a box
};
```

Now, complete this class by writing the necessary functions to find the volume of a box.

- (b) Write C++ program to demonstrate calling of private member functions inside public member function. 3
- (c) What are the restrictions to apply friend function? 1
- (d) Take a class of cricketer of Bangladeshi cricket team. What are the data member (properties) and function member of the class. Which of them would you like to keep as private and public? Justify your answer. 3
3. (a) Write a C++ program to read and print employee information using multiple inheritance. 4
- (b) Describe the mechanism of accessing data members and member functions in the following cases: 6
- i) Inside the main program.
- ii) Inside a member function of the same class.
- iii) Inside a member function of another class.
4. (a) Write C++ program to declare, define and access public static data member. 3
- (b) Adding two distances using binary plus (+) operator overloading program in C++. 4
- (c) Differentiate public, private and protected members in C++ with example. 3

Section-B

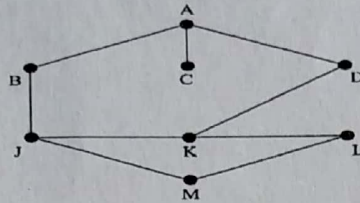
5. (a) Write C++ program to create student class, read and print N student's details, using array of objects. 4
- (b) What is the difference between early binding and late binding? With example. 3
- (c) Write a C++ program to demonstrate use of protected data members in inheritance. 3
6. (a) Why copy constructors is used? 2
- (b) Write a C++ program to demonstrate example of Constructor Overloading. 4
- (c) Briefly describe Encapsulation, Polymorphism, and Inheritance with real life example. 4
7. (a) What is dynamic memory allocation? Explain with C++ consideration. 3
- (b) Why catching all exceptions is required? 3
- (c) Write short note on 'this' pointer in C++. 2
- (d) Write the summary of base-class member accessibility in a derived class. 2
8. (a) Why virtual functions is used in C++? Justify your answer "Virtual Functions Are Hierarchical" with C++ program. 4
- (b) Write a C++ program to write and read values using variables in/from file. 3
- (c) What is generic functions? Why is it used? 3

Section-A

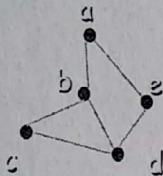
1. a) Define Power set. Determine the power set Power(A) of $A = \{a, b, c, d\}$ 3
b) Among 50 students in a class, 26 got an A+ in the first examination and 21 got an A+ in the second examination. If 17 students did not get an A+ in either examination, how many students got A+ in both examinations? Draw the Venn diagram also. 4
c) Briefly explain symmetric difference with example. 3
2. a) Define equivalence relation with example. 2
b) Consider the following relation R on the set $A = \{1, 2, 3\}$:
 $R = \{(1, 2), (2, 3), (3, 3)\}$
i. Find reflexive(R)
ii. Find symmetric(R) and
iii. Find transitive(R) 4
c) Find the number of relations from $A = \{a, b, c\}$ to $B = \{1, 2\}$
d) Let $S = \{a, b, c\}$, $T = \{b, c, d\}$, and $W = \{a, d\}$. Construct the tree diagram of $S \times T \times W$ and then find $S \times T \times W$.
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?
b) Let f be the function from Z to Z with $f(x) = x^2$. Is f invertible?
c) Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 5x^2 + 9$ and $g(x) = 7x^2 + 7$. What is the composition of f and g? What is the composition of g and f?
4. a) What is tautologies?
b) Give the definition of conjunction, disjunction and negation with truth table.
c) Differentiate between conditional and biconditional statements.
d) Let $A = \{1, 2, 3, 4\}$. Determine the truth value of each of the following statements.
(i) $(\exists x \in A)(x+3=10)$ (ii) $(\forall x \in A)(x+3 < 10)$
(ii) $(\exists x \in A)(x+3 < 5)$ (iv) $(\forall x \in A)(x+3 < 7)$

Section-B

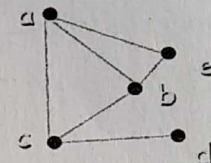
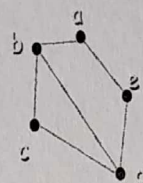
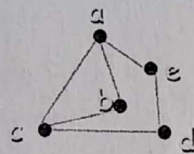
5. a) Define diameter, cut point and bridge
 b) Find the order of vertices of G in following figure are processed using DFS algorithm beginning at vertex A.



- c) Explain graph coloring technique with example.
 6. a) Define the planar graph. Are K_4 , Q_3 , $K_{3,3}$ planar? You should draw the graphs.
 b) Write down the Euler's formula for planar graph. How many regions are there in a planar graph with 30 vertices, each of degree 4?
 c) Are the following two sets of graphs isomorphic?



Set-1



Set-2

7. a) What is 2-trees?
 b) Suppose the preorder and inorder traversals of a binary tree T yield the following sequence of nodes:
 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.
 c) How will you insert a data item in binary search tree?
 d) Differentiate between language and grammar.
 8. a) Define homomorphism.
 b) Briefly explain Groups with example.
 c) Construct a tree by using Huffman algorithm for the following data items and weights:

Data Item	A	B	C	D	E	F	G	H
Weight	22	5	11	19	2	11	25	5

- d) What is heap? Discuss different types of heap.

- 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

1. (a) Briefly discuss about the early of Bangabandhu Sheikh Mujibur Rahman. 5
(b) Describe the educational Background of Bangabandhu Sheikh Mujibur Rahman. 5
2. (a) Which is known as “Magnacarta” of Bengali? 2
(b) Describe Six Point Movement. 8
3. (a) Briefly Explain about BAKSHAL. 5
(b) Discuss “Agartala Conspiracy Case”. 5
4. (a) Discuss the contribution of Bangabandhu Sheikh Mujibur Rahman in Bengali Language Movement. 7
(b) Why Sheikh Mujibur Rahman known as “Bangabandhu”. 3

Section: B

5. (a) Discuss about Assassination of Sheikh Mujibur Rahman. 5
(b) What is the Anti Ayub Movement? 5
6. (a) Write Short note On Foreign Policies of Bangabandhu Sheikh Mujibur Rahman. 5
(b) Briefly explain civil disobediences. 5
7. (a) Discuss about the Governing Period of Bangabandhu Sheikh Mujibur Rahman. 6
(b) Write Short note On 1970's Election. 4
8. Write Summary from “The Unfinished Memoirs” 10

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering

1st Year 2nd Semester B.Sc. Engineering Final Examination-2017

Course Title: Co-Ordinate Geometry & Ordinary Differential Equation **Course Code: MAT 155**
Total Marks: 60 **Time: 3 (three) 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

1. (a) If the direction of axes is turned through an angle θ and the origin remain unchanged then show that, transformed coordinate of (x, y) with respect to new axes is $(x', y') = (x \cos \theta + y \sin \theta, -x \sin \theta + y \cos \theta)$ 5
 (b) 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
2. (a) Reduce the equation $x^2 - 4xy + y^2 + 8x + 2y - 5 = 0$ to its standard form. 4
 (b) If θ be the angle between the straight lines which are represented by the general equation of 2nd degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ then show that,

$$\tan \theta = \frac{2\sqrt{h^2 - ab}}{a+b}$$
 6
3. (a) Define direction cosine and direction ratio. 1
 (b) Find the distance of $(-2, 3, 4)$ from the line through the point $(-1, 3, 2)$ whose direction cosines are proportional to $12, 3, -4$. 4
 (c) Find the shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ 5
 State whether the lines are coplanar or not.
4. (a) Find the condition that one line in symmetrical form and another in general form are intersected. 5
 (b) Define sphere. A sphere of constant radius k passes through the origin and meets the axes in A, B, C . Prove that the centroid of the triangle ABC lies on the sphere $9(x^2 + y^2 + z^2) = 4k^2$ 5

Section-B

5. (a) Define degree of a differential equation with example. Form the differential equation of $xy = ae^x + be^{-x} + x^2$ 3
 (b) Solve $(y + 2)dx + y(x + 4)dy = 0$ by the method of variables separable. 2
 (c) Define homogeneous differential equation. Solve the differential equation $(x^2 + y^2) dx - 2xy dy = 0$ 5
6. (a) Solve $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$ by the method of exact differential equation. 6
 (b) Define linear differential equation. Solve the differential equation $(x^2 + 1) \frac{dy}{dx} + 4xy = x$ 4
7. (a) Find the solution of differential equation $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 0$ 7
 (b) Solve $2 \frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + y = 0$ 3
8. (a) Solve the differential equation $\frac{d^2y}{d\theta^2} + 4y = 4 \tan 2\theta$ by the method of variation of parameter. 5
 (b) A circuit has in series an electromotive force given by $E = 100 \sin 60t$ V, a resistor of 2Ω , an inductor of $0.1 H$, and a capacitor of $\frac{1}{260}$ farads. If the initial current and the initial charge on the capacitor are both zero, find the charge on the capacitor at any time $t > 0$. 5

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Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
1st Year 2nd Semester B.Sc. Engineering Final Examination-2017
Course Title: Electronic Devices and Circuits **Course Code: EEE 155**
Total Marks: 60 **Time: 3 (three) Hours**

N.B. i) Answer **SIX** questions taking any **THREE** from each Section,
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Section-A

1. (a) Differentiate between intrinsic semiconductors and extrinsic semiconductors. 4
(b) Why doping is done in semiconductors? 3
(c) Why does a pure semiconductor behave like an insulator at absolute zero temperature.. 3
2. (a) List the JFET biasing techniques. Deduce the required equations for self-biasing of JFET. 4
(b) In an n-channel JFET biased by potential divider method. It is desired to set the operating point at as shown in figure-2(b). The parameters of JFET are $I_{DSS} = 10 \text{ mA}$ and $V_P = -5 \text{ V}$. Find the value of R_S . 4

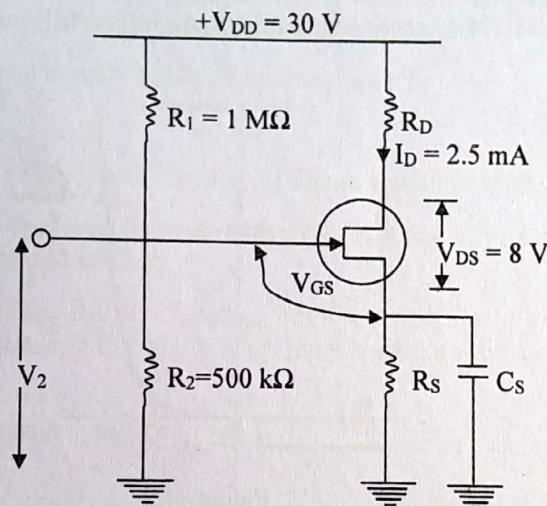
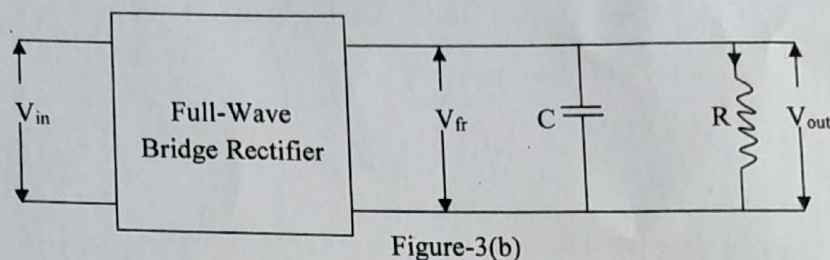


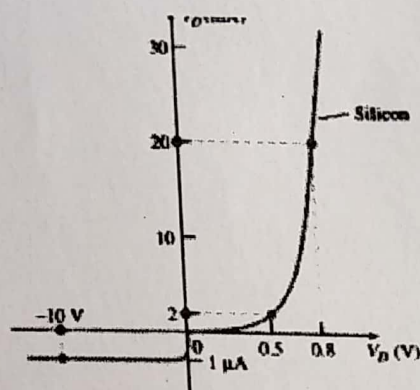
Figure-2(b)

- (c) Differentiate between JFET, MOSFET and Bipolar transistor. 2
3. (a) Define rectifier efficiency. Show that in half-wave rectification, a maximum of 40.6% of a.c. power is converted into d.c. power. Also prove that a full-wave rectifier is twice as effective as a half-wave rectifier. 4

- (b) Consider the following circuit as given in figure-3(b). Sketch the output curve V_{out} , when the input V_{in} is $50 \cos t$. 2



- (c) What is ripple factor? Half-wave rectifier is ineffective but full-wave rectifier is invariably used for conversion of a.c. into d.c., why? Explain with appropriate proof. 4
4. (a) What is resistance level? Define reverse saturation current. 2
 (b) Why an ordinary junction transistor is called bipolar? 3
 (c) Define beta of a transistor. 1
 (d) Determine the dc resistance levels for the diode of Figure-4(d) at (a) I_D 2 mA (b) I_D 20 mA and (c) $V_D = -10$ V 4



Section-B

5. (a) Derive expression for current distribution through a CB and CE configuration of transistor circuit taking leakage current into account. 5
 (b) If the emitter current of a transistor is 0 mA and I_B is 1/100 of I_C determine I_C and I_B . 2
 (c) Define I_{CBO} and I_{CEO} . How they are related? Are they typically close in magnitude? 3

I_{CEO} I_{CBO}

5. b) $0 \text{ mA} = 20 \text{ mA}$ 20 mA $\beta = 100$ I_B

6. (a) Discuss the difference between conventional diode and Zener diode. 2
 (b) Determine the dc level of IB and VC for the network of Figure-6(b). 5

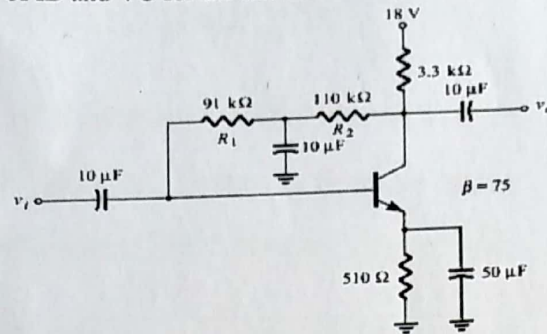


Figure-6(b)

- (c) Why Zener diode is always reversed biased? Briefly explain. 3
7. (a) Derive the relation between current amplification factor (α) and base current amplification factor (β). Also deduce the collector current equation in case of common emitter connection transistor. 4
 (b) For a transistor, $\beta = 45$ and voltage drop across $1\text{ k}\Omega$ which is connected in the collector circuit is 1 volt. Find the base current for common emitter connection. 4
 (c) Why is collector current slightly less than emitter current? 2
8. (a) Why oscillator is used? Draw and describe the circuit operation of RC phase shift oscillator. 4
 (b) In a RC phase shift oscillator, $R_1 = R_2 = R_3 = 1\text{ M}\Omega$ and $C_1 = C_2 = C_3 = 68\text{ pF}$. At what frequency does the circuit oscillate? 3
 (c) What is OP-AMP? Prove that the inverting amplifier works as a negative scaler. Sketch the output waveform from the differentiator when input is square wave for $T = 100\text{ RC}$. 3