Bangabandhu Sheikh Mujibur Rahman Science & Technology University, Gopalganj
Computer Science & Engineering Department

1st Year 2nd Semester B.Sc. Engineering Examination -2020, Session: 2019-2020

Course Code: MAT155 **Course Title:** Co-Ordinate Geometry & Ordinary Differential Equation.

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.

Section A (30 Marks)

Q.1 (a) If the direction of axes is turned through an angle θ and the origin of coordinates remains the same then show that the transformed coordinate of $(x, y) = (x_1 cos\theta - y_1 sin\theta, x_1 sin\theta + y_1 cos\theta)$. [5]

(b) Find the transformation equation of $3x^2 + 2xy + 3y^2 - 18x - 22y + 50 = 0$ when origin is shifted at (2,3) and the axes is turned through an angle 45^0. [5]

Q.2 (a) Show that the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ will represent two parallel straight lines if $a:h = h:b = g:f$. Again show that distance between those straight lines is $2\sqrt{\frac{g^2-ac}{a(a+b)}}$ or $2\sqrt{\frac{f^2-bc}{b(a+b)}}$ and the lines will be coincident of $af^2 = bg^2 = ch^2$. [6]

(b) If the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents pair of straight lines equidistant from origin then prove that $g^4 - f^4 = c(ag^2 - bf^2)$. [4]

Q.3 (a) If one of the lines $ax^2 + 2hxy + by^2 = 0$ be perpendicular to one of the lines $a'x^2 + 2h'xy + b'y^2 = 0$ then prove that $(aa' - bb')^2 + 4(a'h + bh')(ah' + b'h) = 0$ [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 $tan\theta = \frac{2\sqrt{(h^2-ab)}}{(a+b)}$ and hence find the angle between the two lines represented by the equation $-3x^2 - 8xy + 3y^2 - 29x + 3y - 18 = 0$. [6]

Q.4 (a) Convert the equation $\frac{dy}{dx} + xy = x^3y^3$ to Bernoulli form and then solve it. [5]

(b) Find the complete solution of the differential equation: [5]

$\frac{dy}{dx} = 1 - x(y-x) - x^3(y-x)^3$.

Section B (30 Marks)

Q.5 (a) 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 $\theta = \tan^{-1}\left(\frac{2\sqrt{h^2-ab}}{a+b}\right)$. [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]

Q.6 (a) Find the nature of the conic $x^2+2xy+y^2-6x-2y+4=0$. Reduce it to standard form. [5]

(b) Find the equation of the plane passing through the line of intersection of the plane $2x-y=0$ and $3z-y=0$, and perpendicular to the plane $4x+5y-3z+7=0$. [5]

Q.7 (a) Define order and degree of a differential equation. Find the order and degree of the differential equation $(y''+y')^2=(xy''+y)$. [2]

(b) Determine whether or not the given differential equation $\left\{y\left(1+\frac{1}{x}\right)+cosy\right\}dx+(x+logx-xsiny)dy=0$ is exact? Hence solve it. [4]

(c) Find the general solution of the given linear differential equation $\frac{dx}{dy}+\frac{x}{1+y^2}=\frac{tan^{-1}y}{1+y^2}$. [4]

Q.8 (a) Write down the Cauchy-Euler differential equation. Hence find the general solution of $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+4y=2xlnx$. [5]

(b) Solve by the method of variation of parameters the following system of differential equations: [5]

$$y_2+4y=4tan2x.$$

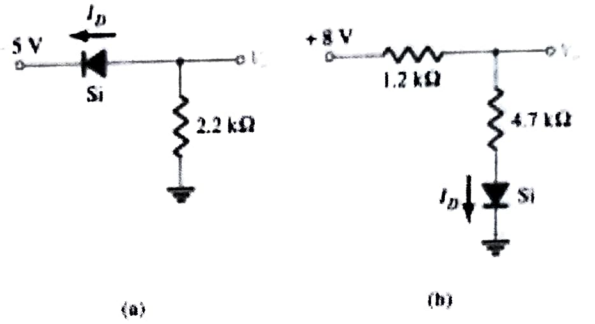
Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
B.Sc. Engineering Examination-2020

Course No: **EEE155** 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.

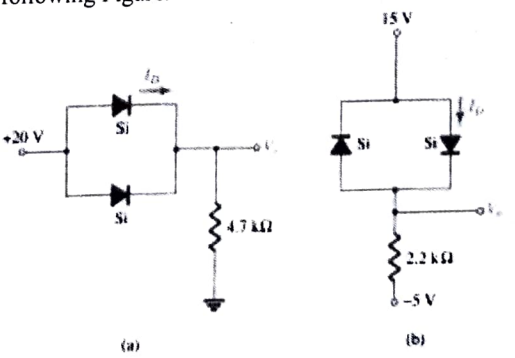
SECTION-A

Q.1 (a) Define diode. Discuss the characteristics of an ideal diode. 3
(b) Write down the differences between intrinsic and extrinsic semiconductors. 3
(c) Determine V_0 and I_D of the following Figure. 4



Q.2 (a) What is an op-amp? Write the circuit symbol of an op-amp. Mention the characteristics of an ideal op-amp. 4
(b) Use the concept of common mode signals and explain how noise if any can be eliminated at the output of an op amp. 2
(c) Explain how an op amp can be used as a summing amplifier. There are three voltage sources V1, V2, V3. It is required to obtain the sum of these signals without the change in magnitude and sign. Design a suitable circuit and explain its operation. 4

Q.3 (a) What is rectifier? Explain the operation of full wave rectifier. 5
(b) Determine V_0 and I_D of the following Figure. 5



Q.4 (a) What is BJT? Elucidate the working principle of PNP transistor. 4
(b) Explain common-emitter configuration with proper sketch. 3
(c) Define biasing. Write down the conditions for BJT biasing. 3

SECTION-B

Q.5 (a) Define an operational amplifier. What are the basic components of an operational amplifier? 3
(b) Draw a summing amplifier and explain its operation. 4
(c) Draw the circuit diagram of integrator and differentiator with an op-amp. 3

Q.6 (a) Differentiate between P-type and N-type Semiconductors. Also name the doping materials used for their formation? 4
(b) Why Silicon is mostly proffered as a Semiconductor material. Explain by giving at least two reasons? 3
(c) Explain Zener Diode as a Voltage Regulator. Explain the materials chosen for LED formation. 3

Q.7 (a) Discuss the MOSFET structure. 3
(b) Explain the working principle of N-channel depletion mode MOSFET. 4
(c) What is CMOS? Draw a CMOS inverter circuit and explain it. 3

Q.8 (a) Draw the common emitter circuit and sketch the input and output characteristics. Also explain active region, cutoff region and saturation region by indicating them on the characteristic curve. 4
(b) In a full wave rectifier, the input is from 30-0-30V transformer. The load and diode forward resistances are 100Ω and 10Ω respectively. Calculate the average voltage, dc output power, ac input power, rectification efficiency and percentage regulation. 3
(c) Explain the Enhancement mode of JFET along with their Transfer Curves. 3

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

1st Year 2nd Semester B.Sc. Engineering Examination-2020

Course No: BST155
Full Marks: 60

Course Title: Bangabandhu in Science and Technology
Time: 3 hours

N.B.
i) Answer **SIX** questions, taking any **THREE** from each section.
ii) All questions are of equal values.

SECTION-A (30 Marks)

Q.1 (a) Define Operation Searchlight. 04
(b) Describe the historic events of the Liberation War in 1971. 06

Q.2 (a) Explain the importance of Six Point Movement in the evolution of Bengali Nationalism. 10

Q.3 (a) Describe the background of Language Movement. 05
(b) How did Language Movement regain the identity of Bengales? 05

Q.4 (a) What is Agartala Conspiracy Case? 04
(b) To what context it was imposed? 06

SECTION-B (30 Marks)

Q.5 (a) What is the significance of election of 1970? How did it pave the way of Liberation War? 05
What do you know about the historic 7th March speech? Why did UNESCO recognize 7th March speech as documentary heritage? 05

Q.6 (a) Why Bangabandhu is called the 'Charismatic' leader? 03
(b) Review Bangabandhu's foreign policy? 07

Q.7 (a) Mention the challenges faced by Bangabandhu as a ruler of post-independent Bangladesh? 07
To what extent was he successful in overcoming these challenges? 03

Q.8 (a) Write a review on Bangabandhu's Unfinished Memories. 10

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science & Engineering
1st Year 2nd Semester B.Sc. Engineering Examination-2020

Course Title: Object Oriented Programming **Course Code: CSE 151**
Full Marks: 60 **Time: 3(Three) Hours**

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

Section A

Q.1 (a) State the important features of object oriented programming. 2

(b) Briefly describe Encapsulation and Polymorphism with real life example. 4

(c) C++ program to create student class, read and print N student's details using array of objects. 4

Q.2 (a) What is inheritance? Why and when to use inheritance? Write a program in C++ to demonstrate this. 5

(b) Compare and contrast different types of inheritance in C++. 3

(c) When do we declare a member of a class static? 2

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 use parameterized constructor to set the value of **base** and **height**. 4

(c) What are the different access specifiers used in C++? Give the properties of each one of them. 4

Q.4 (a) Differentiate between abstraction and encapsulation in C++. 2

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

(c) Write a program to make a function "Account()" that can access the private data members of two different classes "Employee" and "Student" using the concept of friend function. 5

Section B

Q.5 (a) Define polymorphism? Explain function overloading and operator overloading. 3

(b) What are virtual functions? Give an example of virtual functions with a standalone C++ program. 3

(c) Design three class student, test and results where result is inherited from test and test is inherited from student. Write possible functions to initialize the values. Write main function for execution by creating objects. 4

Q.6 (a) Write down the differences between early and late binding. 2

(b) What does 'this pointer' do? Explain using an example and what are the applications of 'this' pointer. 3

(c) Consider the following base class: 5

```
class Shape
{
  public:
  int width, height;
  void setWidth(int w)
  {
    width = w;
  }
  void setHeight(int h)
  {
    height = h;
  }
};
```

Now define a derived class named Rectangle that will inherit the Shape class and show the area of a rectangle as output.

Q.7 (a) What is dynamic memory allocation? Explain it with considering C++. 3

(b) What do you mean by friend function and friend class? 2

(c) What is multithreading? What are the ways to create a thread in C++? How to launch a thread using function objects and function pointer? 5

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) Write a program in C++ to describe the mechanism for accessing data members and member functions in the following cases: 4

I. Inside the main program
II. Inside a member function of the same class
III. Inside a member function of a different class

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
1st Year 2nd Semester B.Sc. Engineering Examination-2020

Course No: CSE153 Course Title: Discrete Computational Theory
Total marks: 60 Time: 3 hours.

N.B.
i. Answer SIX questions, taking any THREE from each section.
ii. All questions are of equal values

Section A

Q.1 (a) State the converse, contrapositive and inverse of the statement. "A positive integer is a prime only if it has no divisors other than 1 and itself". 4

(b) Determine the value of each statement if the universe is nonzero integers 3
i) $\exists x \exists y[(3x + y = 8)\text{^}(2x - y = 7)]$
ii) $\forall x \exists y[x * y = 2]$

(c) Prove or disprove that for every integer n, 4n + 7 is odd 3

Q.2 (a) Consider the following relation on the set A = {1, 2, 3, 4}: 2+3
R = {(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)}
i. Draw its directed graph
ii. Check whether it is equivalence or partial ordering relation.

(b) Let A = {1, 2, 3}, B = {a, b, c}, and C = {x, y, z}. Consider the following relations R and S from A to B and from B to C, respectively. 5
i. Find the composition relation R∘S
ii. Find the matrices MR, MS, and MR∘S
iii. Compare MR∘S to the product MRMS.

Q.3 (a) A warehouse contains 10 motors. Three of them are defective. The inspection of finding defective motor is carried out in two phases. In the first phase the inspector randomly selects and in the second phase, the inspector again randomly selects another motor. Find the probability tree of the two phase inspection. When (i) the part is replaced and (ii) the part is not replaced. 4

(b) Find the minimum x that satisfies $x \equiv 2\ mod\ 3, x \equiv 3\ mod\ 5, x \equiv 1\ mod\ 7$ 3

(c) Construct a truth table for the expression $(p \rightarrow q)\ \upsilon\ (\neg p \rightarrow q)$ 3

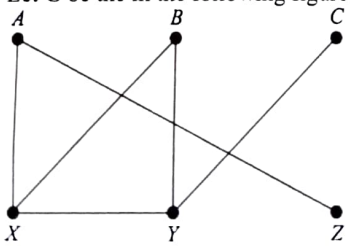
Q.4 (a) Define function, inverse function, 1 to 1 function and onto functions with examples. 4

(b) For integers $n, r\ with\ n \geq r \geq 1$ prove $\binom{n+1}{r} = \binom{n}{r} + \binom{n}{r-1}$ 4

(c) How many bit strings of length 5 contain more 0's than 1's? 2

Section B

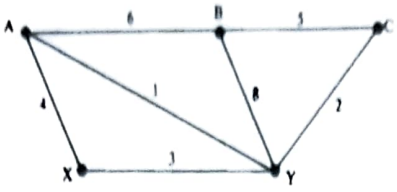
Q.5 (a) Let G be the in the following figure: 4



Find: (i) All simple paths from A to C (ii) All cycles (iii) G – Y (iv) All cut points and (v) all bridges

(b) Find the order of vertices of G as in 5(a) are processed using DFS algorithm beginning at vertex A. 3

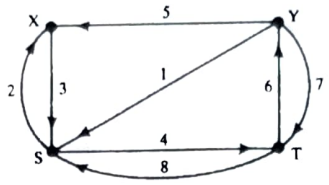
(c) Find a minimal spanning tree of the following weighted graph using Kruskal's algorithm 3



Q.6 (a) What are Euler paths and Hamilton paths; Show that a connected multi graph with at least two vertices has an Euler circuit if and only if all of its vertices have even degree. 6

(b) How many ways are there for 8 men and 5 women to stand in a line so that no two women stand next to each other? 4

Q.7 (a) Consider the weighted graph G in below, where, say, their array DATA: X, Y, S, T maintains the vertices in memory. 2+3



i. Find the weight matrix of G

ii. Find the matrix Q of shortest paths using Warshall's algorithm.

(b) Distinguish between Tree and Binary Tree. 1

(c) Suppose the preorder and inorder traversals of a binary tree T yield the following sequences of nodes. Draw the diagram of T. 4
Preorder: P, B, R, D, L, M, E, F, G, H, J, K
Inorder: R, L, M, D, E, B, G, H, F, K, L, P

Q.8 (a) Derive the numbers of relations on a set with n elements that are (i) reflexive, (ii) reflexive and symmetric, and (iii) antisymmetric. 4

(b) Define equivalence relation and partition. Give an example of an equivalence relation. 4

(c) Find the value of $\sum_{j=1}^{n} j^2$ 2