

North Western University, Khulna
Department of Computer Science and Engineering
Semester Final Examination; **Fall-2023**
Program: B.Sc. in Computer Science and Engineering (HSC Intake)
2nd Year 1st Semester
Course Title: Object Oriented Programming
Course Code: CSE-2101

Time: 2.15 Hours

Full Marks: 50

Section-A

Answer question **No.4** and any **Two** out of **Three**

1. a) Write down some features and advantage of object-oriented programming. **02**
b) Write down short notes on the following concepts of oop (any two): **04**
 - i. Message Passing
 - ii. Class and Objects
 - iii. Dynamic Bindingc) Write an OOP program to evaluate the following investment equation: **04**
$$P = (1 + r)^n$$
2. a) Draw the water-fall model of implicit conversion. What do you mean by cascading of I/O operators? Give a proper example. **05**
b) Find out the errors in the following code snippets, correct them, and give the outputs: **05**

I. `#include<iostream.h>`
`int main()`
`{`
`int i = 10, j = 5, modresult = 0,`
`divresult = 0;`
`modresult = i % j;`
`cout<< modresult << " ";`
`divresult = i/modresult;`
`cout << endl << divresult;`
`return 0;`
`}`

II. `#include<iostream.h>`
`int main()`
`{`
`int i[5] = {5,6,7,8,5}, j;`
`(i[1] == i[0]) ? (j = 2) : (j = 1);`
`if(j>=1)`
`cout<< "OK";`
`else`
`cout<< "YES";`
`return 0;`
`}`
3. a) What do you mean by overloading of a function? When do you use this concept? **05**
b) What is the main purpose of inline function? What do we have to do to make a member function inline of a class? Give a proper example to explain. **05**
4. Write an OOP program which can take input of cricket players name, runs, innings, times not out and display all provided information along with batting average as output. **05**
Formula for batting average = $runs / (innings - times\ not\ out)$.

Section-B

Answer question **No.8** and any **Two** out of **Three**

5. a) Can we use the same function name for a class member function and an outside function in the same program file? If yes, how are they distinguished? If no, give reasons. 05
- b) What is the forward declaration of a class? Write down some of the special characteristics of a friend function. 05
6. a) Explain the array of objects with a proper example. 05
- b) Define default constructor. How many ways can we call constructor function? Explain with examples. 05
7. a) Describe the syntaxes and diagrams of all types of inheritance. When do we use the protected visibility specifier for a class member? 05
- b) Explain function overriding. 05
8. Write an OOP program that identifies a given number as prime or not using single inheritance. 05

North Western University, Khulna
Department of Computer Science and Engineering
Semester Final Examination; **Fail-2023**
Program: B.Sc. in Computer Science and Engineering (HSC Intake)
2nd Year 1st Semester
Course Title: Engineering Mathematics- III
Course Code: Math-2131

Time: 2 Hours 15 minutes

Full Marks: 50

Section-A

Answer question **No.4** and any **Two** out of **Three**

1. a) Define: i) Continuity ii) Differentiability iii) Analytic Function 5
b) If $f(z) = u(x, y) + iv(x, y)$ be an analytic function it satisfies Cauchy-Riemann equations. 5
2. a) Find the region of convergence of the sequence 5
$$\sum_{n=1}^{\infty} \frac{(n+2)(n+1)}{(n+4)(n+3)} (z-2i)^n$$

b) State and prove Green's Theorem. 5
3. a) Verify Green's theorem for 6
$$\oint_c (3xy + 5x)dx + x^2ydy$$

Where, c is a closed region bounded by the parabola $y^2 = x$ and $y = x^2$.
b) Show that the p-series is convergent for $p > 1$. 4
4. Define gradient, divergence and curl with examples. 5

Section-B

Answer question **No. 8** and any **Two** out of **Three**

5. Evaluate $\int_{(2,4)}^{(5,8)} (2x + 3y)dx + (x^2y)dy$, along the straight line from 10
i) (2,4) to (5,8)
ii) (2,4) to (2,8) and then from (2,8) to (5,8).
6. Verify Cauchy's theorem for the function $f(z) = z + 2x - 3iy$ where c is the square with vertices $1 \pm i, -1 \pm i$. 10
7. State and prove Stoke's Theorem. 10
8. When Mr. X goes to North Western University, the probability that he walks is 0.3 and the probability that he uses rickshaw is 0.7. When he walks, the probability of listening music is 0.9. When he uses rickshaw the probability the he listen music is 0.35. 5
i) Illustrate this information using a tree diagram.
Given that, he does not listen music in any day.
ii) Find the probability that he walks.

North Western University, Khulna
Department of Computer Science and Engineering
Semester Final Examination; **Fall-2023**
Program: B.Sc. in Computer Science and Engineering (HSC Intake)
2nd Year 1st Semester
Course Title: Data Structures
Course Code: CSE-2103

Time: 2 Hours 15 Minutes

Full Marks: 50

Section-A

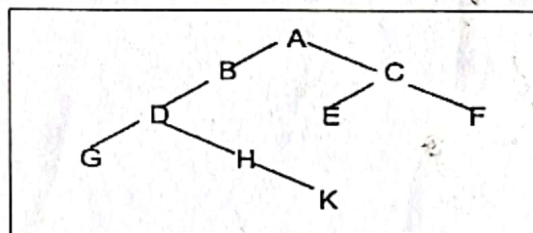
Answer question **No.4** and any **Two** out of **Three**

1. a) Define data structure. Explain the difference between an algorithm and a program. **05**
b) Explain Linear and Non-Linear data structure. Explain two dimensional array representation in the memory? **05**
2. a) What is Stack? Write algorithms for PUSH and POP operations of stack using array. **05**
b) Discuss the pseudocode of insertion mechanism after given node in a linked list of size 5. **05**
3. a) Discuss different types of linked lists. Explain the advantages of linked list over array. **05**
b) Consider the following queue where QUEUE is allocated 6 memory cells: **05**
FRONT=2, REAR=4 QUEUE : , A, C, D, ,
Describe the queue including FRONT and REAR, as the following operations take place.
 - i. K, L, M are added to the queue
 - ii. Two letters are deleted and
 - iii. R is added to the queue
4. Write down the proper algorithm of Binary search. Explain is the complexity of Binary Search. **05**

Section-B

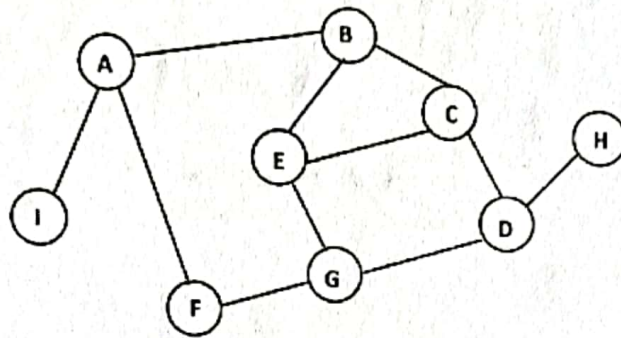
Answer question **No.8** and any **Two** out of **Three**

5. a) What is Spanning Tree? Traverse the following tree in preorder, post order and in order. **05**



b) Differentiate graph and tree. Traverse following graph using DFS.

05



6. a) What is complete binary tree? Explain the algorithm for creating heap from given set of elements. 05

b) What is chaining? How does it help in hashing? Give example. 05

7. a) What is Binary Search Tree? Consider an empty binary search tree and insert following elements step by step in the tree: 05

40, 60, 50, 33, 35, 55, 11, 12

b) Write down the method to delete any leaf node from a binary search tree. 05

8. Convert following infix expression into its equivalent postfix expression using stack: 05

$$A + (B * C - (D / E \uparrow F) * G) * H$$

North Western University, Khulna

Department of Computer Science and Engineering

Semester Final Examination; **Fall-2023**

Program: B.Sc. in Computer Science and Engineering (HSC Intake)

2nd Year 1st Semester

Course Title: Computer Architecture

Course Code: CSE-2105

Time: 2.15 Hours

Full Marks: 50

Section-A

Answer question **No.4** and any **Two** out of **Three**

1. a) Define Computer Architecture, Computer Organization, Structure and Function. 05
b) Explain the different types of functions with figures. 05
2. a) What is the Von Neumann machine structure? Explain IAS memory format. 06
b) Define Accumulator, Multiplier Quotient, Program Counter, and Instruction Register. 04
3. a) Define execution time, throughput, clock cycle, clock rate. What is the relationship between Execution time and Performance? 05
b) Suppose we have two implementations of the same instruction set architecture. Computer A has a clock cycle time of 250 ps and a CPI of 2.0 for a program, and computer B has a clock cycle time of 500 ps and a CPI of 1.2 for the same program. Which computer is faster for this program and by how much? 05
4. Draw the state diagram of instruction cycle with interrupts. 05

Section-B

Answer question **No.8** and any **Two** out of **Three**

5. a) What do you understand by Addressing modes? Explain register indirect addressing with an appropriate diagram and example. 05
b) Explain different types of data hazards. 05
6. a) What is System Bus? Define different kinds of system bus. 04
b) Define Instruction Pipeline. Explain Resource Hazard and its solution with appropriate diagrams. 06
7. a) What is a Control Unit? Differentiate between hardwired control unit and micro programmed control unit. 05
b) What is interrupt? Explain how the cpu will handle when there are multiple interrupts with appropriate figures? 05
8. Explain direct cache mapping and fully associative cache mapping with figures. 05

North Western University, Khulna
Department of Computer Science and Engineering
Semester Final Examination; **Fall-2023**
Program: B.Sc. in Computer Science and Engineering (HSC Intake)
2nd Year 1st Semester
Course Title: Discrete Mathematics
Course Code: CSE-2107

Time: 2 Hours 15 Minutes

Full Marks: 50

Section-A

Answer question **No.4** and any **Two** out of **Three**.

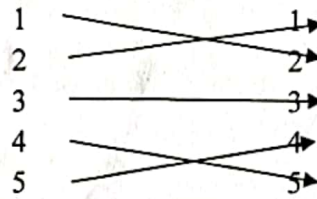
1. a) List the elements of the following sets. Here $N = \{1, 2, 3, \dots\}$. 06
- a) $A = \{x : x \in N, 3 < x < 12\}$
b) $B = \{x : x \in N, x \text{ is even, } x < 15\}$
c) $C = \{x : x \in N, 4 + x = 3\}$
- b) Write the dual of each equation: 04
- a) $A \cup B = (B^c \cap A^c)^c$
b) $(U \cap A) \cup (B \cap A) = A$
2. a) Let $A = \{1, 2, 3\}$, $B = \{5, 6, 7\}$ and $C = \{c, d\}$ 05
Find: i) $(A \times B) \cup (B \times C)$ ii) $(A \cup B) \times C$
- b) Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Let R be the following relations from A to B : 05
 $R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$
- i) Determine the matrix of the relation.
ii) Draw the arrow diagram.
iii) Determine domain and range.
3. a) Given $A = \{1, 2, 3, 4\}$. Consider the following relation in A : 06
 $R = \{(1,1), (2,2), (2,3), (3,2), (4,2), (4,4)\}$
- i) Draw the directed graph.
ii) Is R 1) reflexive 2) symmetric 3) transitive, or 4) antisymmetric?
iii) Find R^{-1} .
- 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. 04
 $R = \{(1, b), (2, a), (2, c)\}$ and $S = \{(a, y), (b, x), (c, y), (c, z)\}$
- i) Find the composition relation $R \circ S$.
ii) Find the matrix $M_{R \circ S}$ of the respective relations $R \circ S$.
4. a) Find the truth table of $\neg p \wedge q$. 02
- b) Show that $\neg(p \vee q) \vee (\neg p \wedge q) \equiv \neg p$. 03

Section-B

Answer question **No.8** and any **Two** out of **Three**

5. a) $A = \{1, 2, 3, 4\}$ and g is a function $g: A \rightarrow A$, as shown below:

05



Compute $g \circ g$. Is $g \circ g$ one-to-one and onto function?

- b) When does a function become invertible? Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 2x - 3$. Is it invertible? If it is invertible then find a formula for f^{-1} .

05

6. a) Show that the proposition $p \vee (q \vee r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent.

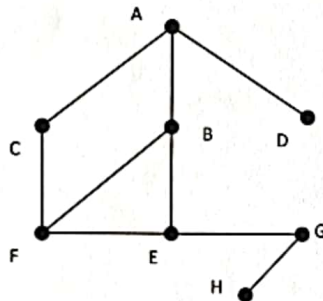
03

- b) Obtain the dnf of $p \wedge (p \rightarrow q)$.

03

- c) Apply the BFs algorithm to the following graph.

04

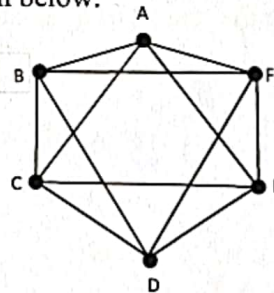
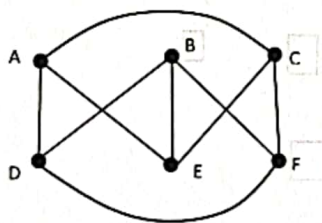


7. a) Draw the graph $K_{2,5}$.

01

- b) Draw a planner representation of each graph below:

04



- c) What is spanning tree and minimum spanning tree? Write the prim's algorithm form minimum spanning tree.

05

8. Verify the proposition $p \vee \neg(p \wedge q)$ is tautology and the proposition $p \wedge \neg p$ is contradiction.

05

North Western University, Khulna
 Department of Computer Science and Engineering
 Semester Final Examination; **Fall-2023**
 Program: B.Sc. in Computer Science and Engineering (HSC Intake)
 2nd Year 1st Semester
 Course Title: Electronic Devices and Circuits
 Course Code: **EEE-2121**

Time: 2 Hours 15 Minutes

Full Marks: 50

Section-A

Answer question **No. 4** and any **Two** out of **Three**

1. a) Realize the approximate Equivalent circuit, Simplified circuit and Ideal diode model of a semiconductor diode. 4
- b) What is ripple factor? Determine I_1 , I_2 , I_3 from Fig. 1(b). 6

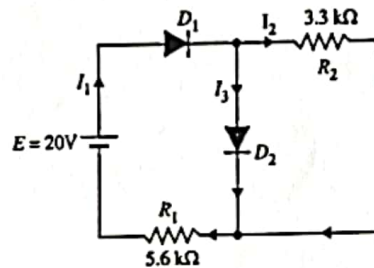


Fig. 1(b)

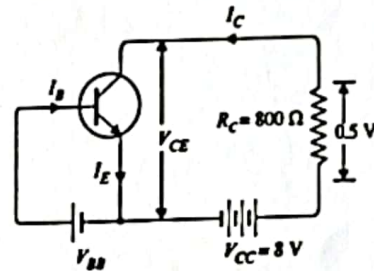


Fig. 2(c)

2. a) Determine the collector-emitter voltage and base current from the circuit shown in Fig. 2(c). $\alpha = 0.96$. 6
- b) For a single stage transistor amplifier, the collector load is $R_C = 2k\Omega$ and the input resistance is $R_i = 1k\Omega$. If $\alpha = 0.9$, calculate the voltage gain of the amplifier. 4
3. a) Describe the modes of operation of BJT. What is linear amplification? 4
- b) Determine the values of $V_{CE(off)}$ and $I_{C(sat)}$ for the circuit shown in Fig. 3(b). 6

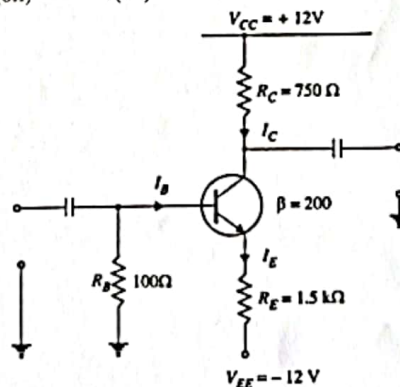


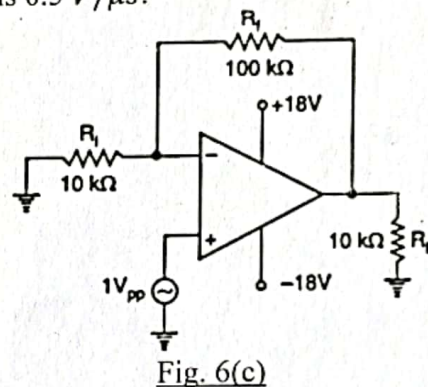
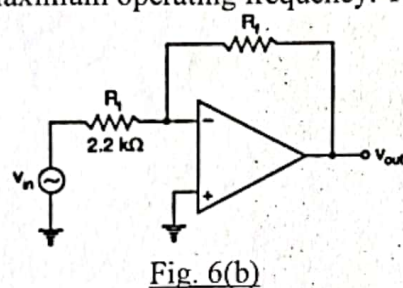
Fig. 3(b)

4. Describe the Hybrid- π Small Signal AC model for the BJT. Draw the equivalent forms of Hybrid- π Small Signal AC model for the BJT. 5

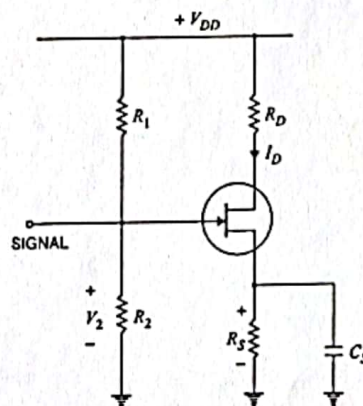
Section-B

Answer question No. 8 and any Two out of Three

5. a) Draw a basic Darlington Transistor Configuration. Two transistors in a Darlington transistor has $\beta_1 = 50$ and $\beta_2 = 60$. Determine the equivalent current gain. 4
 b) Draw the block diagram of a sinusoidal oscillator. 3
 c) Explain the Barkhausen Criterion for undamped oscillations. 3
6. a) What do you mean by Operational Amplifier? Draw the operational blocks of Op-Amp. 4
 b) Given the Op-Amp configuration in Fig. 6(b), determine the value of R_f required to produce a closed-loop gain of -100. 2
 c) For the non-inverting amplifier circuit shown in Fig. 6(c). Find (i) closed-loop gain. 4
 (ii) Maximum operating frequency. The slew rate is $0.5 \text{ V}/\mu\text{s}$.



7. a) Clearly explain the operation of a JFET. 3
 b) State the differences between JFET and BJT. 3
 c) In the Fig. 7(c), It is desired to set the operating point at $I_D = 2.5 \text{ mA}$ and $V_{DS} = 8 \text{ V}$. If $V_{DD} = 30 \text{ V}$, $R_1 = 1 \text{ M}\Omega$ and $R_2 = 500 \text{ k}\Omega$, find the value of R_S . Given that, $I_{DSS} = 10 \text{ mA}$ and $V_{GS(off)} = -5 \text{ V}$. 4



8. Why do we use SCR? Draw the 2 transistor model of SCR. Draw the 2 SCR model of TRIAC. 5