ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Computer Science)

WARNING

1. **PLAGIARISM OR HIRING OF GHOST WRITERS (S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM THE AWARD OF A DEGREE/CERTIFICATE IF FOUND AT ANY STAGE.**
2. **SUBMITTING ASSIGNMENT(S) BORROWED OR STOLEN FROM OTHERS (S) AS ONE'S OWN WILL BE PENALIZED AS DEFINED IN THE "AIOU PLAGIARISM POLICY".**

Course: Discrete Mathematics (MATH-3005) **Semester: Autumn, 2025**
Level: BS DSODL(5094/5095)

Please read the following instructions for writing your assignments. (BS) (ODL Mode).

1. All questions are compulsory and carry equal marks, but within a question, the marks are distributed according to its requirements.
2. Read the question carefully and then answer it according to the requirements of the question.
3. Avoid irrelevant discussion/information and reproducing from books, study guides, or allied material.
4. Handwritten scanned assignments are not acceptable.
5. Upload your typed (in Word or PDF format) assignments on or before the due date.
6. Your own analysis and synthesis will be appreciated.
7. Late submission of assignments will not be accepted.
8. The students who attempt their assignments in Urdu/Arabic may upload a scanned copy of their handwritten assignments (in PDF format) on the University LMS. The size of the file should not exceed 5MB.

Total Marks: 100 **Pass Marks: 50**

ASSIGNMENT No. 1
(Units: 1–5)

Q. 1 If A $\{1,2,3\}$ and $B=\{x,y\}$, how many elements are in the Cartesian product $A\times B$? (20)

Q. 2 Explain why the implication $p \rightarrow q$ is considered **true** when p is false, regardless of the truth value of q. (20)

Q. 3 What is the contrapositive of the statement "If a number is divisible by 6, then it is even"? Are the original statement and its contrapositive logically equivalent? Justify your answer. (20)

Q. 4 Let $R=\{(1,1),(2,2),(3,3),(1,2)\}$ be a relation on the set $A=\{1,2,3\}$. Is R reflexive? Justify your answer by checking each required ordered pair. **(20)**

Q. 5 Describe how an equivalence relation on a set leads to a partition of that set. Give a concrete example using congruence modulo 3 on the integers. **(20)**

Total Marks: 100 Pass Marks: 50

ASSIGNMENT No. 2
(Units: 6–9)

Q. 1 Let f:R→R be defined by f(x)=2x+3 .
a) Prove that f is bijective.
b) Find the inverse function f ^−1 (x) and verify that f(f −1 (x))=x . **(20)**

Q. 2 Explain the difference between a countable and an uncountable set. Give one example of each and briefly describe why the set of real numbers R is uncountable using Cantor's diagonal argument.

(20)

Q. 3 Convert the decimal number 93 into:
a)Binary
b)Octal
c)Hexadecimal
Show all conversion steps clearly. **(20)**

Q. 4 Using 8-bit two's complement representation:
a) Represent the decimal number –42 in binary.
b) Compute 25−42 using two's complement addition. Show all steps and indicate whether overflow occurs. **(20)**

Q. 5 Explain the difference between a countable and an uncountable set. Give one example of each and briefly describe why the set of real numbers R is uncountable using Cantor's diagonal argument. **(20)**