Dumkal College

U.G. 6th Semester 1st Internal Examination-2024

MATHEMATICS
[HONOURS]
Course Code: MATH-H-DSE-T-3A & MATH-H-DSE-T-4A

Full Marks: 10+10   Time: 1 Hour

The figures in the right- hand margin indicate marks.
Symbols have their usual meaning.

MATH-H-DSE-T-3A

1. Answer any **three** questions: 3 × 2 = 6

   a) For any interval I, is it necessary that $I - I = 0$ as in the case of any real number? Justify your answer.

   b) Find $I - J$ if $I = [5,6]$ and $J = [-2,4]$.

   c) If $I = [-4, -2]$ and $J = [3,5]$, find I/J.

   d) Define union and intersection of two fuzzy sets A and B.

   e) State Zadeh's Extension principle.

2. Answer any **one** question: 1× 4 =4
   a) Prove the Cancellation law for interval addition. Show that $IK = JK$ does not imply $I = J$.

   b) State and prove first decomposition theorem.

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1. Answer any **three** questions: 3 × 2 = 6

   a) Let (X, τ) be a topological space and $A \subset X$. Show that $Å$ is the largest open set contained in A. ($Å = $ interior of A)

   b) Define indiscrete and discrete Topology.
   c) Show that union of two topologies need not be to be a topology.
   d) Prove that a subset A of a topological space is closed if and only if $\bar{A} = A$.
   e) Let (X, τ) be an indiscrete space. Show that any non-empty subset A of X is dense in X.

2. Answer any **one** question: 1 × 4 = 4

   a) Show that intersection of an arbitrary collection of topologies on a set $X(\neq 0)$ is a topology on X.
   b) Show that a co-countable space (X, τ) is discrete if and only if X is a countable set.

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